THE LEADING UK CONSUMER ELECTRONICS TECHNOLOGY MAGAZINE

TELEVISION

SERVICING · VIDEO · SATELLITE · DEVELOPMENTS

SEPTEMBER 1996 £2.35

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Capacitance bridge

Intro into the Internet

Servicing the Samsung VI710

An RGB-to-VGA monitor conversion

Time-lapse VCRs

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Fault Reports TVs, VCRs, Camcorders and Satellite

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SPECIAL OFFER

The Vann Draper SG4160B mains-powered RF signal generator is on special offer to readers at £129 inclusive – see page 827. It covers 100kHz to 150MHz in six ranges, each tunable, with a usable third harmonic output at up to 450MHz. Internal 1kHz AM at up to 30% is available, and external modulation from 50Hz to 20kHz can be applied.

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AC125	30p	BD267	45p	BLY48	85p	MJ2955	55p	2N1893	30p	5.0	130p	BR86D	43p	6522	280p	AN7178	180p	HA13432	400p
AC126	30p	BD269	45p	BR100	14p	MJ3000	100p	2N2102	50p	10.0	140p	2A/600V		6800	210p	AN7222	75p	HA17524	250p
AC127	30p	BD278	50p	BR103	37p	MJ3001	100p	2N2218A	24p	11.0	250p	BR88D	43p	6802	220p	AN7254	150p	ICL7106	650p
AC128K	40p	BD311	100p	BR303	85p	MJE29A	30p	2N2219	24p	12.0	120p	2A/800V		680	500p	AN7256	250p	ICL7660	240p
AC141K	45p	BD314	100p	BSS74	33p	MJE30A	30p	2N2221	23p	14.756	200p	BR32	43p	36808	500p	AN7310	60p	KA2102	150p
AC176	22p	BD315	150p	BSX20	15p	MJE340	25p	2N2222	23p	15.0	160p	2A/200V		6809	500p	AN7311	90p	KA2130	150p
ACY18	48p	BD317	150p	BT100A	70p	MJE350	80p	2N2369	15p	24.0	250p	BR34	43p	6810	150p	AN7410	150p	KA2206	150p
ACY19	48p	BD331	40p	BT106	180p	MJE520	30p	2N2484	15p			2A/400V		6818	380p	AY3-1015	290p	KA2209	125p
AD149	60p	BD332	40p	BT109	90p	MP8112	45p	2N2646	40p			BR36	44p	6821	130p	AY3-1270	800p	KA2210	230p
AF125	50p	BD361	60p	BT119	100p	MPSA05	15p	2N2904	20p			2A/600V		6840	290p	AY3-1350	450p	KA2212	80p
AF139	30p	BD362	60p	BT146	99p	MPSA06	15p	2N2905	20p			BR62	80p	6845	200p	AY3-8910	360p	KA2213	130p
AF239	30p	BD370	30p	BTY79	140p	MPSA13	15p	2N2906	18p			6A/200V		6850	90p	AY3-8912	400p	KA2214	150p
BB105B	18p	BD371	30p	BU105	80p	MPSA20	15p	2N2907	18p			BR64	72p	8085A	300p	BA301	55p	KA2261	100p
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BC107	8p	BD433	28p	BU109	80p	MPSA43	15p	2N3053	18p			BR251	150p	8088	480p	BA313	60p	KA2264	100p
BC108	8p	BD434	30p	BU110	90p	MPSA70	15p	2N3054	40p			25A/100V		8156	300p	BA333	80p	KA2284	100p
BC109	8p	BD435	31p	BU111	100p	MPSA92	20p	2N3055	38p			BR252	165p	8224	240p	BA401	60p	KA2401	150p
BC109C	10p	BD436	30p	BU124	60p	MPSA93	20p	2N3055H	50p			25A/200V		8226	240p	BA402	50p	KA2412	350p
BC140	20p	BD437	28p	BU126	65p	MR510	35p	2N3442	85p			BR254	185p	8250	750p	BA511	145p	KA2912	125p
BC141	20p	BD438	36p	BU180	100p	MR856	36p	2N3702	9p			25A/400V		8251	200p	BA514	160p	KA2914A	300p
BC142	20p	BD439	40p	BU184	100p	OC28	350p	2N3703	9p			BR256	200p	8253	160p	BA516	150p	LA1130	240p
BC143	20p	BD440	40p	BU204	65p	OC29	250p	2N3704	9p			25A/600V		8257	220p	BA521	100p	LA1150	150p
BC147	8p	BD441	40p	BU205	70p	OC35	350p	2N3705	9p			BR258	240p	8271	3400p	BA524	240p	LA1185	150p
BC148	8p	BD533	50p	BU206	100p	OC36	250p	2N3706	9p			25A/800V		8279	270p	BA526	180p	LA1201	75p
BC159	8p	BD534	38p	BU208	70p	OC45	50p	2N3707	9p			BR351	185p	8283	400p	BA527	95p	LA1210	140p
BC160	30p	BD535	38p	BU208A	75p	OC200	180p	2N3710	12p	78L05	24p	35V/100V		8284	440p	BA532	100p	LA1222	80p
BC171	10p	BD536	38p	BU208AT	200p	R2008B	100p	2N3711	12p	78L08	24p	BR352	200p	8287	260p	BA534	220p	LA1230	130p
BC172	10p	BD537	40p	BU208D	130p	R2010B	100p	2N3771	85p	78L12	24p	35V/200V		8288	650p	BA536	150p	LA1364	200p
BC177	14p	BD538	40p	BU209	90p	S2000A3	175p	2N3772	90p	78L15	24p	BR354	220p	8748	700p	BA546	160p	LA1365	120p
BC178	14p	BD643	50p	BU225	120p	S2000AF	175p	2N3773	100p	78L18	24p	35V/400V		8755	800p	BA612	120p	LA1368	220p
BC179	14p	BD645	50p	BU226	120p	S2055A	175p	2N3799	18p	78L24	24p	BR356	230p	8T26	95p	BA656	110p	LA1385	170p
BC182	7p	BD647	50p	BU312	90p	S2055AF	200p	2N3819	29p	79L05	35p	35V/600V		8T28	110p	BA658	350p	LA2000	150p
BC182L	7p	BD649	50p	BU325	55p	S2530A	100p	2N3903	11p	79L08	35p	BR358	260p			BA684	400p	LA2101	270p
BC183	7p	BD675	40p	BU326A	75p	S2800M	72p	2N3906	11p	79L12	35p	35V/800V				BA685	400p	LA2200	190p
BC183L	7p	BD676	40p	BU406	60p	TIP29	15p	2N4031	25p	79L15	35p	BY164 1.5A/				BA1310	160p	LA3160	120p
BC184	7p	BD677	38p	BU406D	85p	TIP29A	22p	2N4401	12p	LM309K	100p	100V	40p			BA1320	75p	LA3210	65p
BC184L	7p	BD678	40p	BU407	55p	TIP29C	25p	2N4403	12p	LM317T	100p	BY176 1.5A/				BA1330	120p	LA3300	140p
BC212	7p	BD679	40p	BU407D	75p	TIP29E	40p	2N5061	20p	LM323K	350p	800V	40p			BA1360	160p	LA3301	110p
BC212L	7p	BD680	40p	BU408	60p	TIP30	25p	2N5088	20p	78H08KC	800p					BA4403	220p	LA3361	100p
BC213	7p	BD681	45p	BU408D	75p	TIP30C	25p	2N5192	50p	79H12KC	700p					BA5101	350p	LA3375	300p
BC213L	7p	BD682	45p	BU409	85p	TIP31A	22p	2N5241	500p	79HGKC	800p					BA5102	140p	LA4030	180p
BC214	7p	BD705	50p	BU426A	70p	TIP31C	27p	2N5245	45p							BA5204	200p	LA4031	140p
BC214L	7p	BD707	50p	BU500	100p	TIP32	24p	2N5294	30p							BA5402	180p	LA4032	140p
BC237	7p	BD708	50p	BU505	90p	TIP32A	21p	2N5296	30p							BA5406	180p	LA4051	160p
BC238	7p	BD711	50p	BU505D	90p	TIP32C	28p	2N5448	12p							BA5408	180p	LA4100	85p
BC239	7p	BD736	50p	BU505DF	90p	TIP33	50p	2N6107	40p							BA6104	250p	LA4101	80p
BC300	20p	BD826	50p	BU506	100p	TIP33C	60p	2N6292	40p							BA6208	175p	LA4102	100p
BC301	20p	BD828	50p	BU506D	70p	TIP34	50p	2N6385	120p							BA6209	85p	LA4110	120p
BC302	20p	BD839	55p	BU506DF	120p	TIP34C	60p	2N6403	160p							BA6304	120p	LA4120	270p
BC303	20p	BD897	50p	BU508A	70p	TIP35C	65p									BA6305	140p	LA4140	60p
BC304	25p	BD899	50p	BU508AF	95p	TIP36C	65p									BA6410	220p	LA4160	100p
BC327	7p	BD977	50p	BU508D	90p	TIP41A	20p									BA6411	250p	LA4182	180p
BC328	7p	BDX33	60p	BU508DF	115p	TIP41C	22p									BA6393	150p	LA4190	300p
BC337	7p	BDX65	80p	BU508V	110p	TIP42A	20p									BA7001	150p	LA4191	140p
BC338	7p	BDW24	55p	BU508VF	100p	TIP42C	22p									BA7004	200p	LA4200	130p
BC441	28p	BDW93	50p	BU526	75p	TIP47	40p									BA7007	200p	LA4201	120p
BC446	8p	BDW94	50p	BU536	100p	TIP48	40p									BA7021	180p	LA4260	230p
BC477	18p	BDY92	100p	BU546	125p	TIP50	60p									BA7022	350p	LA4261	300p
BC516	22p	BF137	35p	BU608	120p	TIP51	80p									BA7751LS	150p	LA4270	300p
BC537	25p	BF167	30p	BU626	120p	TIP52	80p									BA7752	250p	LA4420	140p
BC546	8p	BF181	18p	BU705	130p	TIP54	85p									BA7755	150p	LA4422	130p
BC547	8p	BF183	20p	BU706DF	175p	TIP105	65p									BA7767AS	155p	LA4430	130p
BC548	8p	BF195	7p	BU706F	150p	TIP106	65p									CA3011	110p	LA4440	200p
BC549	8p	BF199	8p	BU807	70p	TIP107	65p									CA3048	190p	LA4445	200p
BC550	8p	BF200	16p	BU806	70p	TIP110	40p									CA3052	190p	LA4460	120p
BC556	8p	BF225	30p	BU807	60p	TIP111	40p									CA3054	95p	LA4461	120p
BC557	7p	BF240	16p	BU902	110p	TIP112	35p									CA3085	135p	LA4500	200p
BC558	8p	BF245	25p	BU903	110p	TIP112H	50p									CA3088E	200p	LA4505	220p
BC559	8p	BF254	15p	BU920	100p	TIP115	30p									CA3089E	150p	LA4508	200p
BC560	8p	BF255	12p	BU922	110p	TIP116	30p									CA3090Q	250p	LA4510	100p
BC637	20p	BF256	18p	BU930	130p	TIP117	30p									CA3130S	100p	LA4520	170p
BC639	20p	BF257	18p	BU2508A	130p	TIP120	37p									CA3134E	280p	LA4550	200p
BC640	20p	BF259	18p	BU2508AF	130p	TIP121	35p									CA3140E	38p	LA4555	120p
BCY33	200p	BF262	25p	BU2508D	130p	TIP122	30p									CA3160	85p	LA4570	130p
BCY34	200p	BF270	18p	BU2508DF	150p	TIP125	30p									CA3189E	230p	LA5112	200p
BCY70	16p	BF273	15p	BU2520AF	225p	TIP126	40p									CA3193E	230p	LA5523	150p
BCY71	16p	BF311	21p	BU2520DF	225p	TIP127	35p									CA3260E	170p	LA5527	150p
BCY72	16p	BF336	20p	BU2525AF	325p	TIP130	30p									CA3290E	150p	LA5700	300p
BD115	30p	BF337	20p	BUH515	200p	TIP131	30p									CX108	950p	LA7011	220p
BD124P	50p	BF338	20p	BUT11AF	55p	TIP132	30p									CX136	600p	LA7033	400p
BD131	25p	BF362	30p	BUT12	80p	TIP141	65p									CX139A	750p	LA7042	280p
BD132	25p	BF367	13p	BUT56A	100p	TIP142	75p									CX141	750p	LA7046	300p
BD133	50p	BF371	17p	BU18	80p	TIP145	50p									CX145	725p	LA7224	150p
BD135	20p	BF421	18p	BU18AF	80p	TIP146	70p									CX150B	325p	LA7505	250p
BD136	20p	BF422	21p	BUX10	150p	TIP147	80p									CX175	325p	LA7507	250p
BD137	20p	BF423	25p	BUX11	200p	TIP150	90p									CX187	825p	LA7520	200p
BD138	20p	BF455	12p	BUX12	150p	TIP151	60p									CX804A	775p	LA7620	500p
BD139	20p	BF458	19p	BUX20	350p	TIP2955	50p									CX867	575p	LA7800	90p
BD140	20p	BF462	50p	BUX21	450p	TIP3055	50p									CX868	525p	LA7801	100p
BD144	90p	BF471	28p	BUX22	450p	TIPL763A	200p									CX877	300p	LA7802	300p
BD157	38p	BF472	28p	BUX37	220p	TIPL791A	80p									HA1125	120p	LA7806	260p
BD166	30p	BF479	30p	BUX40	210p	TIS61	15p									HA1197	130p	LA7808	250p
BD175	30p	BF494	16p	BUX41	200p	TIS90	15p									HA1199	130p	LA7820	100p
BD177	30p	BF495	16p	BUX42	200p	TIS93	20p									HA1319	200p	LA7823	200p
BD179	32p	BF595	16p	BUX47A	220p	VK1010	88p									HA1338	300p	LA7910	150p
BD181	45p	BF596	16p	BUX48A	150p	VN10KM	60p									HA1339A	350p	LA7940	200p
BD182	60p	BF615	30p	BUX80	180p	ZTX107	11p									HA1377	120p	LC7131	260p
BD184	60p	BF617	30p	BUX84	50p	ZTX108	11p									HA1388	320p	LC7132	400p
BD187	30p	BF760	40p	BUX85	50p	ZTX109	12p									HA1389	210p	LC7137	450p
BD201	33p	BF763	40p	BUX86	30p	ZTX212	20p									HA1392	120p	LF347	110p
BD202	38p	BF870	22p	BUX87	50p	ZTX300	10p									HA1394	170p	LF353	48p
BD203	42p	BF871	22p	BUX98A	350p	ZTX301	16p									HA1397	200p	LF355	80p
BD204	42p	BF960	38p	BU69A	200p	ZTX302	10p									HA1398	240p	LF357	70p
BD222	31p	BF961	35p	BUY71	250p	ZTX303	20p									HA11219	280p	LF398	300p
BD225	31p	BF964	38p	BUZ11	200p	ZTX304	10p									HA11221	180p	LM301	26p
BD232	31p	BFR90	85p	BUZ71	75p	ZTX320	20p									HA11225	130p	LM311	35p
BD233	30p	BFR91	99p	BUZ80	200p	ZTX501	13p									HA11235	120p	LM319	165p
BD234	32p	BFT43	30p	BY448	20p	ZTX502	10p									HA11251	190p	LM324	30p
BD235	28p	BFX29	20p	BYT11	25p	ZTX503	18p									HA11423	140p	LM335Z	120p
BD236	30p	BFX84	20p	C106D	28p	ZTX504	25p									HA11724	650p	LM339	35p
BD237	21p	BFX85	20p	IRF630	150p	2N696	26p									HA12002	220p	LM348	50p
BD238	24p	BFX87	15p	J174	38p	2N697	22p									HA12003	250p	LM358	45p
BD239	30p	BFX88	15p	J300	50p	2N698	40p									HA12005	180p	LM380	80p
BD240	40p	BFX89	60p	MJ900	200p	2N78	22p									HA12017	100p	LM381	150p
BD241A	40p	BFY50	14p	MJ1000	200p	2N914	28p									HA13001	110p	LM382	130p
BD243A	50p	BFY51	14p	MJ1001	200p	2N930	18p									HA13002	200p	LM386	60p
BD244	50p	BFY52	14p	MJ10012	300p	2N1131	28p									HA13006	400p	LM387	100p
BD245	50p	BFY56	25p	MJ15003	250p	2N1132	28p									HA13007	400p	LM393	45p

VOLTAGE REGULATORS

7805	25p
7806	25p
7808	25p
7812	25p
7815	25p
7824	25p
7905	25p
7906	30p
7908	30p
7912	30p
7915	30p
7918	30p
7924	30p
78L05	24p
78L08	24p
78L12	24p
78L15	24p
78L18	24p
78L24	24p
79L05	35p
79L08	35p
79L12	35p
79L15	35p
LM309K	100p
LM317T	100p
LM323K	350p
78H08KC	800p
79H12KC	700p
79HGKC	800p

VALVES

DAF96	100p
DY87	80p
EBF80	60p
ECC84	80p
ECH84	90p
ECL84	100p
EF183	75p
EF184	85p
EL500	100p
EY86	70p
EY87	70p
EY88	80p
PC97	100p
PCC85	60p
PCF80	100p
PCF801	110p
PCF806	115p
PCH200	100p
PCL81	65p
PCL82	80p
PCL84	60p
PFL200	110p
PL36	120p
PL83	60p
PL84	80p
PL95	180p
PY81	100p
PY500A	190p

LEDs

3mm	
RED	5p
YELLOW	8p
GREEN	8p
5mm	
RED	5p
YELLOW	8p
GREEN	8p

RECTANGULAR LEDs

5mm × 2.5mm	
RED	5p
YELLOW	8p
GREEN	8p

OPTO COUPLERS

4N37	48p
4N38	68p
AN203	210p

BRIDGE RECTIFIERS

W005	16p
1A/50V	
W01	18p
1A/100V	
W02	19p
1A/200V	
W04	21p
1A/400V	
W06	23p
1A/600V	
W08	28p
1A/800V	
BR81D	33p
2A/100V	
BR82D	33p
2A/200V	

I.C. SOCKETS

8 PIN	5p
14PIN	6p
16PIN	7p
18PIN	10p
20PIN	12p
22PIN	13p
24PIN	14p
28PIN	16p
40PIN	18p

ZENERS

400 mWatts	
2V7 to 39V	5p
1.3 Watts	
2V7 to 39V	9p

CRYSTALS

Freq in MHz	
2.4576	180p

TRIACS

TIC206D	60p
4A/400V	
TIC225D	69p
6A/400V	
TIC226D	68p
8A/400V	
TIC236D	85p
12A/400V	
TIC246D	105p
16A/400V	
TIC253D	190p
20A/400V	
TIC263D	205p
25A/400V	

THYRISTORS

2N5061	20p
0.8A/60V	
TIC116C	59p
8A/300V	
TIC116D	70p
8A/400V	
TIC126D	75p
12A/400V	
TIC126M	90p
12A/600V	
C106D	28p
4A/400V	
BR103	37p
BR303	85p
BT106	180p
BT119	100p
17088	200p
17089	200p
17127	200p
15/80H	230p
15/85R	230p
SG264	800p
SG613	1600p

COMPUTER ICs

Z80ACPU	100p
Z80ADMA	200p
Z80ACTC	140p
Z80ASIO-1	210p
Z80ASIO-2	210p
75107	65p
75110	75p
75113	100p
75122	110p
75154	100p
75162	700p
75182	95p
75183	95p
75195	185p
2114	150p
2532	200p
2716	100p
2732	200p
2732A	220p
2764	150p
27C64	200p
27128	150p
27256-25	150p
27512	300p
4116	40p
4164-15	80p
4164-12	90p
41256-15	80p
41256-12	100p
41256-10	110p
41464-12	150p
6116	80p
6264-10	210p
62256-12	300p

LINEAR ICs

AN203	210p
AN210	165p
AN214Q	170p
AN228	280p
AN252	150p
AN259	250p
AN262	140p
AN271	230p
AN274	250p
AN301	330p
AN303	250p
AN304	360p
AN315	210p
AN316	350p
AN360	100p
AN362	140p
AN366	150p
AN610	160p
AN3312	350p
AN3821K	600p
AN3822K	600p
AN3990K	300p
AN3991K	400p
AN5025	250p
AN5033	400p
AN5132	250p
AN5150	400p
AN5151	600p
AN5215	100p
AN5256	150p
AN5262	175p
AN5265	80p
AN5352	600p
AN5411	450p
AN5421	150p
AN5429	420p
AN5512	100p
AN5515	160p
AN5520	550p
AN5521	100p
AN5612	200p
AN5613	200p
AN5615	300p
AN5620	250p
AN5622	275p
AN5625	400p
AN5712	180p
AN5722	140p
AN5730	160p
AN5732	120p
AN5753	130p
AN5763	250p
AN5790	240p
AN5791	225p
AN5836	450p
AN5900	130p
AN6135	120p
AN6247	200p
AN6270	400p
AN6300	600p
AN6306	380p
AN6320	180p
AN6332	320p
AN6341	200p
AN6344	440p
AN6350	610p
AN6359	500p
AN6360	320p
AN6362	400p
AN6371	350p
AN6387	480p
AN6884	200p
AN7105	170p
AN7110	75p
AN7114	120p
AN7115	110p
AN7116	90p
AN7120	100p
AN7130	75p
AN7140	170p
AN7145	195p
AN7146	210p
AN7154	180p

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Please send £1 P&P and VAT at 17½%. Govt, Colleges, etc. Orders accepted. Quotations given for large quantities. Please allow 7 days for delivery. All brand-new Components. All valves are new and boxed. Prices quoted are subject to stock availability and may be changed without notice. TV & video parts sold are replacement parts.

LINEAR ICs / JAPANESE TRANSISTORS

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
LM431	50p	STK441	680p	STK5422	375p	STR30115	275p	TA7784	250p	TDA1574	125p	TDA3586	750p	TDA8170	170p	UPC1158H	70p	2SA937	20p
LM710	45p	STK443	700p	STK5431	550p	STR30120	400p	TA8132AN	200p	TDA1576	170p	TDA3590	300p	TDA8172	250p	UPC1178H	250p	2SA939	140p
LM723	40p	STK457	470p	STK5434	570p	STR30123	450p	TA8205	250p	TDA1578A	210p	TDA3591	360p	TDA8173	280p	UPC1180C	200p	2SA940	50p
LM741DIL	18p	STK459	560p	STK5436	500p	STR30125	550p	TA8210	300p	TDA1579	200p	TDA3592A	350p	TDA8174	300p	UPC1185H2	400p	2SA942	60p
LM741MET	45p	STK460	660p	STK5441	400p	STR30130	250p	TA8215	300p	TDA1596	200p	TDA3640	350p	TDA8175	300p	UPC1186	80p	2SA949	70p
LM747	55p	STK461	620p	STK5451	390p	STR40090	350p	TA8216H	375p	TDA1598	250p	TDA3651	200p	TDA8178	400p	UPC1187	150p	2SA950	18p
LM1889	300p	STK463	950p	STK5461	500p	STR41090	400p	TA8227	250p	TDA1600	275p	TDA3652	500p	TDA8185	300p	UPC1188H	350p	2SA952	30p
LM1894N	200p	STK465	720p	STK5462	500p	STR44115	550p	TA8691N	550p	TDA1670A	230p	TDA3652TX10	800p	TDA8190	200p	UPC1197	140p	2SA953	60p
LM3900	40p	STK501	550p	STK5464	300p	STR45111	550p	TA8718N	550p	TDA1675	250p	TDA3653	150p	TDA8191	425p	UPC1198H	200p	2SA954	30p
LM3909	100p	STK561	450p	STK5466	500p	STR50020	450p	TAA550	25p	TDA1701	300p	TDA3654	90p	TDA8192	275p	UPC1222	130p	2SA958	60p
LM3914	160p	STK563	415p	STK5467	400p	STR50092	550p	TBA120S	40p	TDA1771	250p	TDA3710	300p	TDA8196	150p	UPC1225H	220p	2SA963	120p
LM3915	160p	STK583	500p	STK5468	300p	STR50103A	260p	TBA396	70p	TDA1870A	200p	TDA3720	175p	TDA8214B	225p	UPC1230	200p	2SA965	40p
LM3916	270p	STK760	600p	STK5471	330p	STR50113	500p	TBA520	120p	TDA1872A	275p	TDA3724	500p	TDA8215B	300p	UPC1238	120p	2SA966	35p
L200	200p	STK770	400p	STK5473	480p	STR50115	500p	TBA530	100p	TDA1904	80p	TDA3725	500p	TDA8303	350p	UPC1270H	250p	2SA968	55p
M491BB1	600p	STK772B	480p	STK5476	350p	STR51041	500p	TBA540	90p	TDA1905	80p	TDA3730	400p	TDA8304	600p	UPC1274V	250p	2SA970	25p
M494B1	700p	STK780	575p	STK5478	380p	STR50213	500p	TBA560	90p	TDA1908A	90p	TDA3740	480p	TDA8305	500p	UPC1277	240p	2SA979	35p
M50115P	320p	STK1039	460p	STK5479	300p	STR53041	500p	TBA800	40p	TDA1910	225p	TDA3750	400p	TDA8340	200p	UPC1278	240p	2SA984	25p
M50117P	500p	STK1040	640p	STK5481	520p	STR54041	350p	TBA810AS	40p	TDA1940	180p	TDA3760	350p	TDA8341	250p	UPC1288V	230p	2SA985	60p
M50119P	525p	STK1049	700p	STK5482	285p	STR56041	500p	TBA820	55p	TDA1941	300p	TDA3771	460p	TDA8380	200p	UPC1298V	320p	2SA988	25p
M50784	300p	STK1050	650p	STK5483	440p	STR56041	550p	TBA820M	35p	TDA1950	175p	TDA3791	300p	TDA8390A	650p	UPC1318	300p	2SA992	30p
M50786	500p	STK1060	700p	STK5486	450p	STR58041	325p	TBA920	100p	TDA2002	50p	TDA3800	350p	TDA8405	550p	UPC1335V	320p	2SA993	50p
M50790	600p	STK1070	850p	STK5488	480p	STR59041	350p	TBA950	100p	TDA2003	65p	TDA3803A	500p	TDA8415	650p	UPC1350	115p	2SA999	30p
M51161	300p	STK1080	940p	STK5490	450p	STR60001	525p	TBA990	60p	TDA2004	150p	TDA3810	200p	TDA8417	550p	UPC1363	190p	2SA1006	90p
M51381P	200p	STK2025	620p	STK5632	450p	STR61001	550p	TC5020	200p	TDA2005	150p	TDA3825	225p	TDA8421	500p	UPC1363C	300p	2SA1008	125p
M51387P	800p	STK2028	500p	STK5725	450p	STR80145	550p	TC5081AP	80p	TDA2006	70p	TDA3840	300p	TDA8245	500p	UPC1364C	350p	2SA1009	200p
M51544	150p	STK2029	480p	STK5730	450p	STR81145	600p	TC9106	500p	TDA2007	120p	TDA3843	200p	TDA8432	550p	UPC1365	250p	2SA1010	225p
M51848	150p	STK2038	700p	STK6316	300p	STRD1206	600p	TC9125BP	410p	TDA2008	100p	TDA3845	325p	TDA8433	600p	UPC1370C	300p	2SA1011	80p
M54523P	200p	STK2048	950p	STK6324B	500p	STRD1406	600p	TC9134	750p	TDA2009	160p	TDA3856	400p	TDA8440	300p	UPC1373	85p	2SA1012	85p
M54563P	200p	STK2110	550p	STK6431	850p	STRD1706	450p	TC9142	320p	TDA2010	150p	TDA3857	350p	TDA8442	200p	UPC1377C	200p	2SA1013	100p
M58484	500p	STK2125	580p	STK6722	725p	STRD1806	400p	TC9143	300p	TDA2020	120p	TDA3950	225p	TDA8443	350p	UPC1378	180p	2SA1015	15p
M51516	260p	STK2129	750p	STK6732	1000p	STRD1816	400p	TC9145	150p	TDA2030	80p	TDA4050	150p	TDA8451	400p	UPC1382	110p	2SA1016	30p
M51518	200p	STK2139	675p	STK6822	900p	STRD3035	300p	TC9148	200p	TDA2040	140p	TDA4092	350p	TDA8452	200p	UPC1384	425p	2SA1018	100p
MB3712	140p	STK2155	900p	STK6922	500p	STRD4412	500p	TC149	225p	TDA2048	600p	TDA4100	225p	TDA8453	350p	UPC1387C	250p	2SA1020	30p
MB3713	130p	STK2230	470p	STK6932	525p	STRD4512	400p	TC9150	425p	TDA2054M	110p	TDA4180	145p	TDA8490	350p	UPC1394	120p	2SA1021	35p
MB3714	270p	STK2240	740p	STK6962	275p	TA7054	190p	TC9152	425p	TDA2107	250p	TDA4190	180p	TDA8702	275p	UPC1397	350p	2SA1023	60p
MB3715	250p	STK2250	650p	STK6972	490p	TA7061	115p	TC9153	300p	TDA2148	350p	TDA4200	360p	TDA8703	500p	UPC1403CA	650p	2SA1026	90p
MB3722	280p	STK3041	370p	STK6981B	600p	TA7066	120p	TC9156	300p	TDA2151	375p	TDA4280	320p	TDA8708	900p	UPC1420CA	450p	2SA1029	60p
MB3730	160p	STK3042	375p	STK6982	600p	TA7089	300p	TC9163	375p	TDA2170	260p	TDA4282	360p	TDA8732	400p	UPC1421CA	650p	2SA1036	60p
MB3731	220p	STK3044	500p	STK7216	420p	TA7119	150p	TC9164	400p	TDA2220	200p	TDA4290	290p	TDA9045	400p	UPC1423CA	550p	2SA1037	50p
MB3756	160p	STK3062	500p	STK7217	400p	TA7120	55p	TC9172P	300p	TDA2270	250p	TDA4400	175p	TDA9080	550p	UPC1470	200p	2SA1038	40p
MB3759	200p	STK3082	550p	STK7225	500p	TA7137	60p	TCA9940	100p	TDA2320	80p	TDA4420	120p	TDA9403	180p	UPC1488H	150p	2SA1048	25p
MB8719	360p	STK3102II	530p	STK7226	600p	TA7140	100p	TCEP100	100p	TDA2501	400p	TDA4421	300p	TDA9503	150p	UPC1505C	400p	2SA1051	300p
MC1455	45p	STK3152II	900p	STK7251	500p	TA7157	100p	TD62308AP	200p	TDA2503	200p	TDA4426	170p	TDA9513	300p	UPC1514CA	200p	2SA1060	120p
MC1496	65p	STK3156	500p	STK7308	350p	TA7193	320p	TD62382	200p	TDA2504	200p	TDA4427	200p	TEA1002	650p	UPC1515CA	250p	2SA1069	150p
MC3401	45p	STK4017	400p	STK7309	400p	TA7200	200p	TD62506	200p	TDA2505	300p	TDA4431	150p	TEA1007	120p	UPC1520CA	250p	2SA1076	230p
NE555	20p	STK4019	480p	STK7310	470p	TA7205	110p	TD62705	250p	TDA2506	500p	TDA4437	300p	TEA1009	100p	UPC1536C	550p	2SA1077	300p
NE556	40p	STK4021	380p	STK7348	400p	TA7207	150p	TD6304AP	300p	TDA2510	450p	TDA4439	220p	TEA1017	280p	ZN423	100p	2SA1081	80p
NE558	80p	STK4024II	550p	STK7356	425p	TA7208	125p	TD6306P	350p	TDA2514A	500p	TDA4440	180p	TEA1019	130p	ZN424	100p	2SA1082	80p
NE565	110p	STK4025	530p	STK7358	440p	TA7214	220p	TD6350P	200p	TDA2515	450p	TDA4442	240p	TEA1024	150p	ZN425	320p	2SA1084	100p
NE567	115p	STK4026	480p	STK7402	560p	TA7217	145p	TD6359P	300p	TDA2530	450p	TDA4443	250p	TEA1045	300p	ZN426	260p	2SA1085	75p
NE571	290p	STK4028	550p	STK7404	400p	TA7220	220p	TDA1001	200p	TDA2532	120p	TDA4445	220p	TEA1060	225p	ZN427	560p	2SA1091	100p
NE592	85p	STK4032II	510p	STK7406	650p	TA7222	90p	TDA1002	200p	TDA2540	85p	TDA4450	225p	TEA1067	150p	ZN429	215p	2SA1094	190p
NE5532P	140p	STK4036	470p	STK7408	675p	TA7223	210p	TDA1003	150p	TDA2541	120p	TDA4452	250p	TEA1080P	170p	ZN459	190p	2SA1095	300p
SAA1006	300p	STK4038	680p	STK7410	900p	TA7225	300p	TDA1005A	175p	TDA2542	110p	TDA4453	275p	TEA1087	40p	ZN1040	640p	2SA1096	80p
SAA1008	450p	STK4040II	650p	STK7554	600p	TA7226	290p	TDA1010A	80p	TDA2543	210p	TDA4480	280p	TEA1101	425p	ZNA134H	2150p	2SA1102	130p
SAA1010	400p	STK4042II	800p	STK7561	650p	TA7227	170p	TDA1011	75p	TDA2545	120p	TDA4482	350p	TEA1330	65p			2SA1103	130p
SAA1024	250p	STK4044	800p	STK7562	1000p	TA7230	100p	TDA1012	120p	TDA2546A	200p	TDA4500	300p	TEA1511	150p			2SA1104	140p
SAA1025	250p	STK4046	350p	STK7563	800p	TA7232	95p	TDA1013A	110p	TDA2549	300p	TDA4501	400p	TEA2000	275p			2SA1105	250p
SAA1075	350p	STK4048	1280p	STK8050	750p	TA7233	120p	TDA1015	85p	TDA2555	175p	TDA4502	550p	TEA2014A	80p			2SA1106	160p
SAA1124	200p	STK4060	510p	STK8250	500p	TA7237	300p	TDA1016	140p	TDA2556	230p	TDA4503	300p	TEA2018A	200p			2SA1104	140p
SAA1250	280p	STK4065	650p	STK8260	1200p	TA7238	400p	TDA1020	110p	TDA2557	225p	TDA4505	300p	TEA2114	200p			2SA1111	90p
SAA1251	380p	STK4101	500p	STK8280	1850p	TA7240	160p	TDA1022	330p	TDA2558	500p	TDA4510	270p	TEA2117	450p			2SA1112	150p
SAA1274	280p	STK4111	500p	STK73410	350p	TA7241	165p	TDA1023	130p	TDA2575A	100p	TDA4555	400p	TEA5114A	200p			2SA1115	30p
SAA1293	550p	STK4112	500p	STK73410II	500p	TA7242	190p	TDA1024	150p	TDA2577A	200p	TDA4556	370p	TL431	45p			2SA1123	40p
SAA3004	400p	STK4121	480p	STK73605	375p	TA7243	320p	TDA1025	320p	TDA2578A	200p	TDA4557	450p	TL061	40p			2SA1124	60p
SAA5000	200p	STK4122	560p	STR370	300p	TA7245	225p	TDA1028	175p	TDA2579A	250p	TDA4560	270p	TL064	80p			2SA1127	50p
SAA5010	220p	STK4131	480p	STR371	400p	TA7267	220p	TDA1029	200p	TDA2582	130p	TDA4600	200p	TL071	38p			2SA1133	120p
SAA5012	400p	STK4132II	600p	STR380	350p	TA7269	260p	TDA1035	160p	TDA2590	170p	TDA4700II	160p	TL074	80p			2SA1141	200p
SAA5020	350p	STK4141II	420p	STR381	390p	TA7270	170p	TDA1041E	250p	TDA2593	110p	TDA4601	120p	TL083	55p			2SA1142	100p
SAA5030	440p	STK4142	530p	STR383	410p	TA7271	220p	TDA1041P	180p	TDA2594	300p	TDA4605	220p	TL084	70p			2SA1145	40p
SAA5040A	280p	STK4151	680p	STR384	350p	TA7272	260p	TDA1044	110p	TDA2595	200p	TDA4610	370p	TMS1000-041	400p			2SA1152	150p
SAA5040B	400p	STK4152	650p	STR440	700p	TA7273	300p	TDA1047	200p	TDA2600	250p	TDA4660	370p	TMS1000NLPM	200p			2SA1156	90p
SAA5050	650p	STK4161	650p	STR450	520p	TA7274	210p	TDA1048	200p	TDA2611A	100p	TDA4800	350p	TMS100-233	400p			2SA1162	30p
SAA5231	300p	STK4162	550p	STR541	600p	TA7280	190p	TDA1053	300p	TDA2630	300p	TDA4935	300p	TMS1024	300p			2SA1169	500p
SAA5243PE	800p	STK4171	900p	STR452	600p	TA7281	200p	TDA1054	180p	TDA2640	220p	TDA4940	325p	TMS1025	350p			2SA1170	500p
SAB3013	200p	STK4172II	680p	STR453	500p	TA7282	160p	TDA1059B	40p	TDA2653A	225p	TDA4950	120p	TMS3617NS	350p			2SA1175	30p
SAB3035	600p	STK4181	680p	STR454	400p	TA7283	200p	TDA1060	140p	TDA2654	200p	TDA5330T	300p	TMS3701BN	300p			2SA1184	120p
STA301A	200p	STK4182II	750p	STR455	500p	TA7288	220p	TDA1062	140p	TDA2670	150p	TDA5410	450p	TMS3712	350p			2SA1186	500p
STA401A	220p	STK4191	700p	STR456	470p	TA7299	200p	TDA1072	150p	TDA2690	100p	TDA5660P	250p	TMS3891	550p			2SA1198	40p
STA403A	270p	STK4192	700p	STR457	600p	TA7310	100p	TDA1074	280p	TDA2730	200p	TDA5700	200p	TPU2732	1200p			2SA1206	60p
STA405A	280p	STK4231II	700p	STR470	400p	TA7312	120p	TDA1077	250p	TDA2760	400p	TDA5708	400p	TPU2735	900p			2SA1208	70p
STA431A	250p	STK4241	1050p	STR1096	275p	TA7313	70p	TDA1082	275p	TDA2780	600p	TDA5709	450p	U111B	250p			2SA1209	100p
STA432A	220p	STK4241V	1250p	STR1195	350p	TA7314	175p	TDA1083	95p	TDA2791	275p	TDA5800	600p	U211B	300p			2SA1210	120p
STA434A	270p	STK4272	500p	STR1229	325p	TA7315	200p	TDA1085	170p	TDA2795	200p	TDA5820	370p	U254B	150p			2SA1215	600p
STA435A	270p	STK4273	550p	STR2005	400p	TA7317P	120p	TDA1087	60p	TDA2822M	60p	TDA5850	175p	U318M	350p			2SA1216	550p
STA441C	220p	STK4301	500p	STR2012	400p	TA7324	75p	TDA1092	100p	TDA2840	200p	TDA6200	750p	U321M	450p			2SA1217	100p
STA456C	240p	STK4311	650p	STR2013	300p	TA7325	90p	TDA1097	475p	TDA3047	100p	TDA7000	170p	U329M	350p			2SA1220	75p
STA471	210p	STK4332	365p	STR2015	550p	TA7328	110p	TDA1151	40p	TDA3048	130p	TDA7010T	120p	U338M	300p			2SA1232	180p
STA901M	280p	STK4352	500p	STR2105	600p	TA7335	85p	TDA1154	50p	TDA3082	200p	TDA7050	200p	U420B	70p			2SA1242	80p
STK0025	420p	STK4362	450p	STR3113	225p	TA7336	180p	TDA1170	85p	TDA3083	200p	TDA7052	120p	U427B	70p			2SA1244	120p
STK0029	360p	STK4372	490p	STR3115	400p	TA7341	250p	TDA1180	120p	TDA3190	100p	TDA7053	200p	U664B	175p			2SA1246	80p
STK0039	600p	STK4392	500p	STR3123	400p	TA7343	120p	TDA1180A	190p	TDA3300B	480p	TDA7056	200p	U2401B	125p			2SA1249	100p
STK0040	520p	STK4432	600p	STR3125	480p	TA7357	340p	TDA1190	80p	TDA3301B	280p	TDA7072	175p	U2829B	130p			2SA1261	150p
STK0049	510p	STK4773	820p	STR3135	250p	TA7358	85p	TDA1200B	80p	TDA3310	120p	TDA7077	175p	U4606B	600p			2SA1262	110p
STK0050	440p	STK4793	800p	STR3212	275p	TA7401	250p	TDA1220	75p	TDA3330	500p	TDA7211	150p	UC3842N	125p			2SA1263	280p
STK0059	620p	STK4803	640p	STR3214	275p	TA7607	200p	TDA1235	300p	TDA3410	150p	TDA7220	100p	UC3844	100p			2SA1264	280p
STK0060	820p	STK4813	800p	STR3215	275p	TA7608	360p	TDA1236	240p	TDA3420	200p	TDA7222	200p	ULN2002	70p			2SA1265	200p
STK0070	1100p	STK4833	700p	STR3315	275p	TA7609	170p	TDA1251	150p	TDA3501	340p	TDA7230A	225p	ULN2003	65p			2SA1283	50p
STK0080	580p	STK4843	720p	STR4090A	650p	TA7611	210p	TDA1270	150p	TDA3502	450p	TDA7233	150p	ULN2068	270p			2SA1284	60p
STK011	330p	STK4853	730p	STR4142	450p	TA7612	300p	TDA1327	200p	TDA3504	300p	TDA7240	175p	ULN2804	170p			2SA1286	60p
STK015	440p	STK4863	700p	STR4211	370p	TA7614	170p	TDA1410	220p	TDA3505	275p	TDA7241	250p	UPC20C	220p			2SA1290	150p
STK016	760p	STK4873	850p	STR4512	400p	TA7616	300p	TDA1412	35p	TDA3506	260p	TDA7250	500p	UPC554	130p			2SA1294	450p
STK025	650p	STK4893	1000p	STR5015	500p	TA7621	300p	TDA1510	170p	TDA3507	450p	TDA7255	500p	UPC555	60p			2SA1295	500p
STK050	1600p	STK4913	900p	STR5100	550p	TA7622	420p	TDA1512	180p	TDA3510	350p	TDA7256	600p	UPC556H	80p			2SA1301	260p
STK077	520p	STK5314	475p	STR5214	475p	TA7628	110p	TDA1514A	450p	TDA3520	650p	TDA7272	170p	UPC571	220p			2SA1302	300p
STK078	580p	STK5315	500p	STR5315	575p	TA7629	220p	TDA1515A	200p	TDA3530	350p	TDA7273	80p	UPC574	60p			2SA1303	400p
STK080	550p	STK5322	500p	STR5412	350p	TA7630	200p	TDA1516Q	350p	TDA3540	200p	TDA7274	60p	UPC575C2	90p			2SA1304	110p
STK082	540p	STK5324	450p	STR6020	325p	TA7632	400p	TDA1517	250p	TDA3541	175p	TDA7275	75p	UPC577	64p			2SA1306	110p
STK084	600p	STK5325	370p	STR9005	400p	TA7640	90p	TDA1519	200p	TDA3560	260p	TDA7284	100p	UPC592	95p			2SA1307	100p
STK085	900p	STK5331	300p	STR9012	450p	TA7641	140p	TDA1519A	200p	TDA3561	300p	TDA7350	650p	UPC595	190p			2SA872	50p
STK086	800p	STK5332	180p	STR10006	450p	TA7658	100p	TDA1520	275p	TDA3561A	300p	TDA7359	300p	UPC596	190p			2SA872A	50p
STK0100	900p	STK5333	1000p	STR11006	400p	TA7668	100p	TDA1521	250p	TDA3562	260p	TDA7360	700p	UPC1001	220p			2SA886	45p
STK0100II	1200p	STK5335	350p	STR12006	450p	TA7680AP	225p	TDA1522	110p	TDA3562TFK	300p	TDA7770	225p	UPC1018	170p			2SA899	40p
STK420	400p	STK5337	500p	STR13006	500p	TA7688	150p	TDA1524	200p	TDA3563	350p	TDA8114	225p	UPC1020	200p			2SA907	650p
STK430	500p	STK5338	295p	STR15006	500p	TA7698	450p	TDA1540	420p	TDA3564	325p	TDA8115	200p	UPC1023	60p			2SA909	500p
STK433	400p	STK5339	400p	STR16006	500p	TA7699	600p	TDA1541	750p	TDA3565	275p	TDA8140	200p	UPC1025	230p			2SA913	100p
STK435	375p	STK5342	245p	STR20005	450p	TA7705	300p	TDA1542	250p	TDA3566	280p	TDA8143	160p	UPC1026	95p			2SA916	30p
STK436	430p	STK5361	375p	STR20012	450p	TA7750	200p	TDA1543	300p	TDA3567	350p	TDA8145	120p	UPC1028	90p			2SA921	40p
STK437	460p	STK5372	260p	STR20015	450p	TA7757	200p	TDA1571	300p	TDA3570	375p	TDA8153	250p	UPC1031H	150p			2SA933	30p
STK439	500p	STK5421	450p	STR30110	400p	TA7769	130p	TDA1572	175p	TDA3580	400p	TDA8160	125p	UPC1032	60p			2SA934	30p
																		2SA935	40p

JAPANESE TRANSISTORS

2SA473	29p
2SA490	45p
2SA496	30p
2SA505	120p
2SA509	35p
2SA537	170p
2SA544	650p
2SA550	150p
2SA562	30p
2SA571	650p
2SA603	100p
2SA606	200p
2SA608	15p
2SA614	150p
2SA634	50p
2SA636	50p
2SA640	60p
2SA642	50p
2SA673	15p
2SA677	35p
2SA678	26p
2SA683	25p
2SA684	25p
2SA699	100p
2SA708	50p
2SA711	280p
2SA715	50p
2SA719	50p
2SA720	20p
2SA725	80p
2SA726	20p
2SA733	15p
2SA747A	425p
2SA748	60p
2SA764	200p
2SA769	80p
2SA770	200p
2SA771	90p
2SA777	35p
2SA781	150p
2SA786	25p
2SA794	50p
2SA798	30p
2SA814	60p
2SA817	20p
2SA836	20p
2SA839	110p
2SA844	20p
2SA872	25p
2SA872A	50p
2SA886	45p
2SA899	40p
2SA907	650p
2SA909	500p
2SA913	100p
2SA916	30p
2SA921	40p
2SA933	30p
2SA934	30p
2SA935	40p

JAPANESE TRANSISTORS

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
2SA1371	100p	2SC1008	20p	2SC1730	10p	2SC2270	60p	2SC2750	300p	2SC3277	280p	2SC3893	225p	2SD836A	60p	2SD1279	600p	2SD1815	100p
2SA1380	75p	2SC1010	225p	2SC1735	70p	2SC2271	30p	2SC2751	270p	2SC3280	200p	2SC3895	400p	2SD837	55p	2SD1288	175p	2SD1825	60p
2SA1381	100p	2SC1012	75p	2SC1739	800p	2SC2274	15p	2SC2752	140p	2SC3281	200p	2SC3897	400p	2SD838	300p	2SD1289	250p	2SD1843	100p
2SA1382	120p	2SC1013	170p	2SC1740	10p	2SC2275	50p	2SC2767	300p	2SC3284	600p	2SC3907	250p	2SD841	110p	2SD1291	400p	2SD1846	350p
2SA1385	180p	2SC1014	140p	2SC1741	35p	2SC2278	70p	2SC2769	400p	2SC3293	85p	2SC3927	250p	2SD844	200p	2SD1292	60p	2SD1849	325p
2SA1386	400p	2SC1030	150p	2SC1755	90p	2SC2290	1800p	2SC2773	700p	2SC3298	50p	2SC3950	120p	2SD845	250p	2SD1297	300p	2SD1850	325p
2SA1423	30p	2SC1047	20p	2SC1756	35p	2SC2291	40p	2SC2774	500p	2SC3299	120p	2SC3953	60p	2SD850	170p	2SD1302	20p	2SD1858	40p
2SA1489	300p	2SC1050	280p	2SC1758	30p	2SC2295	60p	2SC2785	60p	2SC3300	400p	2SC3973	210p	2SD856	48p	2SD1308	80p	2SD1877	175p
2SA1491	300p	2SC1060	70p	2SC1775	10p	2SC2298	35p	2SC2786	20p	2SC3303	100p	2SC3987	220p	2SD858	250p	2SD1309	140p	2SD1878	230p
2SA1493	500p	2SC1061	85p	2SC1781	20p	2SC2307	300p	2SC2787	10p	2SC3306	130p	2SC3996	1200p	2SD863	23p	2SD1310	140p	2SD1879	275p
2SA1516	280p	2SC1070	65p	2SC1789	100p	2SC2308	10p	2SC2791	500p	2SC3307	600p	2SC4006	100p	2SD864	200p	2SD1313	1000p	2SD1884	300p
2SA1535	175p	2SC1096	40p	2SC1809	40p	2SC2312	300p	2SC2792	220p	2SC3309	150p	2SC4020	280p	2SD866	120p	2SD1326	200p	2SD1886	450p
2SB324	40p	2SC1098	120p	2SC1810	250p	2SC2314	70p	2SC2793	700p	2SC3316	280p	2SC4023	325p	2SD866A	140p	2SD1328	60p	2SD1887	300p
2SB546	45p	2SC1106	180p	2SC1815	10p	2SC2316	150p	2SC2808	40p	2SC3317	350p	2SC4056	350p	2SD868	260p	2SD1347	70p	2SD1910	280p
2SB560	25p	2SC1114	415p	2SC1819	70p	2SC2320	10p	2SC2810	360p	2SC3323	480p	2SC4106	200p	2SD870	190p	2SD1348	65p	2SD1911	300p
2SB561	50p	2SC1115	280p	2SC1826	60p	2SC2324	120p	2SC2812	40p	2SC3327	60p	2SC4123	450p	2SD871	300p	2SD1350	150p	2SD1913	50p
2SB562	25p	2SC1116	290p	2SC1827	60p	2SC2329	480p	2SC2814	40p	2SC3331	25p	2SC4124	250p	2SD879	60p	2SD1376	125p	2SD1929	60p
2SB566	90p	2SC1124	270p	2SC1829	500p	2SC2331	50p	2SC2824	75p	2SC3333	120p	2SC4169	60p	2SD880	40p	2SD1379	100p	2SD1939	75p
2SB595	55p	2SC1161	110p	2SC1833	40p	2SC2333	200p	2SC2825	900p	2SC3345	100p	2SC4236	550p	2SD882	25p	2SD1380	100p	2SD1941	500p
2SB596	50p	2SC1162	30p	2SC1834	50p	2SC2334	80p	2SC2826	200p	2SC3352	200p	2SC4237	650p	2SD892A	75p	2SD1384	50p	2SD1959	280p
2SB598	30p	2SC1164	600p	2SC1844	50p	2SC2335	75p	2SC2827	200p	2SC3353	280p	2SC4242	170p	2SD894	35p	2SD1390	350p	2SD1961	50p
2SB600	500p	2SC1165	750p	2SC1645	15p	2SC2344	150p	2SC2832	300p	2SC3355	50p	2SC4301	550p	2SD895	100p	2SD1391	250p	2SD1978	50p
2SB646	40p	2SC1166	100p	2SC1846	35p	2SC2347	60p	2SC2834	400p	2SC3356	120p	2SC4742	275p	2SD896	200p	2SD1392	150p	2SD1984	450p
2SB647	20p	2SC1170	180p	2SC1847	45p	2SC2353	120p	2SC2837	250p	2SC3358	50p	2SC4769	300p	2SD900	400p	2SD1395	150p	2SD2012	50p
2SB648	45p	2SC1172	150p	2SC1855	85p	2SC2360	120p	2SC2839	40p	2SC3361	50p	2SD198	140p	2SD905	450p	2SD1396	120p	2SD2125	225p
2SB649	35p	2SC1173	40p	2SC1856	25p	2SC2361	150p	2SC2853	70p	2SC3376	300p	2SD199	195p	2SD916	130p	2SD1397	120p	2SD2333	200p
2SB688	90p	2SC1195	210p	2SC1865	700p	2SC2362	50p	2SC2877	120p	2SC3377	50p	2SD200	180p	2SD917	300p	2SD1398	120p	2SJ48	425p
2SB703	90p	2SC1212	35p	2SC1870	700p	2SC2365	280p	2SC2878	20p	2SC3378	120p	2SD201	260p	2SD921	320p	2SD1399	300p	2SJ49	425p
2SB705	200p	2SC1213	15p	2SC1875	220p	2SC2369	100p	2SC2879	3200p	2SC3383	80p	2SD257	195p	2SD923	360p	2SD1400	280p	2SJ50	425p
2SB707	200p	2SC1214	15p	2SC1881	70p	2SC2371	25p	2SC2883	60p	2SC3387	550p	2SD313	25p	2SD946	120p	2SD1402	150p	2SJ56	700p
2SB716	20p	2SC1215	25p	2SC1890	15p	2SC2373	210p	2SC2898	200p	2SC3393	80p	2SD315	75p	2SD947	100p	2SD1406	60p	2SJ74	60p
2SB718	60p	2SC1216	200p	2SC1904	125p	2SC2383	50p	2SC2899	50p	2SC3399	50p	2SD325	30p	2SD950	300p	2SD1407	60p	2SJ75	280p
2SB727	200p	2SC1222	15p	2SC1906	15p	2SC2389	45p	2SC2909	60p	2SC3400	35p	2SD330	65p	2SD951	290p	2SD1408	125p	2SJ76	220p
2SB754	80p	2SC1226	75p	2SC1907	20p	2SC2407	110p	2SC2911	80p	2SC3401	50p	2SD348	300p	2SD957A	520p	2SD1409	170p	2SJ77	350p
2SB755	310p	2SC1252	850p	2SC1909	250p	2SC2408	120p	2SC2912	120p	2SC3402	40p	2SD357	40p	2SD958	60p	2SD1412	75p	2SJ79	225p
2SB772	25p	2SC1278	110p	2SC1913	90p	2SC2412K	50p	2SC2921	650p	2SC3409	400p	2SD358	40p	2SD965	35p	2SD1413	60p	2SJ103	75p
2SB774	50p	2SC1279	30p	2SC1921	15p	2SC2440	200p	2SC2922	480p	2SC3412	800p	2SD371	240p	2SD970	170p	2SD1415	190p	2SJ108	60p
2SB775	100p	2SC1306	90p	2SC1923	10p	2SC2458	10p	2SC2928	550p	2SC3416	30p	2SD380	650p	2SD973	60p	2SD1417	125p	2SJ115	525p
2SB791	280p	2SC1308K	350p	2SC1929	180p	2SC2459	50p	2SC2929	280p	2SC3417	90p	2SD381	50p	2SD973A	70p	2SD1425	260p	2SJ117	550p
2SB795	60p	2SC1312	40p	2SC1940	110p	2SC2470	65p	2SC2934	75p	2SC3419	120p	2SD388	150p	2SD985	120p	2SD1426	160p	2SJ119	700p
2SB825	135p	2SC1317	15p	2SC1941	27p	2SC2481	120p	2SC2937	250p	2SC3420	80p	2SD389	60p	2SD986	120p	2SD1427	180p	2SJ161	650p
2SB861	110p	2SC1318	10p	2SC1942	350p	2SC2482	20p	2SC2938	235p	2SC3422	75p	2SD400	14p	2SD1012	40p	2SD1428	220p	2SJ162	680p
2SB882	180p	2SC1325	400p	2SC1944	350p	2SC2483	120p	2SC2939	400p	2SC3423	60p	2SD401	50p	2SD1020	40p	2SD1429	410p	2SK19	45p
2SB886	90p	2SC1327	20p	2SC1945	350p	2SC2484	185p	2SC2944	300p	2SC3446	150p	2SD402	120p	2SD1021	120p	2SD1430	280p	2SK40	50p
2SB950	180p	2SC1328	15p	2SC1946	1500p	2SC2491	200p	2SC2958	50p	2SC3447	200p	2SD415	55p	2SD1022	400p	2SD1431	250p	2SK49	50p
2SB951	190p	2SC1342	15p	2SC1947	450p	2SC2495	1900p	2SC2962	800p	2SC3456	200p	2SD424	350p	2SD1024	130p	2SD1432	400p	2SK55	100p
2SB1009	110p	2SC1345	15p	2SC1957	70p	2SC2498	50p	2SC2979	160p	2SC3457	125p	2SD426	150p	2SD1030	75p	2SD1433	750p	2SK68	100p
2SB1077	180p	2SC1346	100p	2SC1959	10p	2SC2500	25p	2SC2987	250p	2SC3459	180p	2SD427	350p	2SD1031	70p	2SD1438	140p	2SK73	75p
2SB1109	55p	2SC1358	270p	2SC1967	1300p	2SC2502	200p	2SC2988	150p	2SC3460	130p	2SD438	35p	2SD1046	200p	2SD1439	165p	2SK106	40p
2SC182	75p	2SC1359	15p	2SC1969	160p	2SC2519	60p	2SC2995	60p	2SC3461	350p	2SD467	15p	2SD1047	180p	2SD1441	280p	2SK107	40p
2SC372	25p	2SC1360	70p	2SC1970	100p	2SC2527	300p	2SC2999	50p	2SC3466	225p	2SD468	15p	2SD1051	130p	2SD1445	200p	2SK118	50p
2SC380	10p	2SC1364	25p	2SC1971	400p	2SC2534	150p	2SC3001	1400p	2SC3468	70p	2SD471	20p	2SD1060	130p	2SD1450	60p	2SK125	100p
2SC382	50p	2SC1383	25p	2SC1972	600p	2SC2535	300p	2SC3012	300p	2SC3481	300p	2SD525	50p	2SD1062	150p	2SD1451	260p	2SK133	650p
2SC388A	60p	2SC1384	20p	2SC1973	150p	2SC2538	100p	2SC3019	320p	2SC3482	275p	2SD526	70p	2SD1063	200p	2SD1452	350p	2SK134	415p
2SC394	60p	2SC1393	20p	2SC1983	75p	2SC2540	1900p	2SC3025	500p	2SC3486	275p	2SD545	18p	2SD1064	250p	2SD1453	140p	2SK135	415p
2SC403	25p	2SC1394	15p	2SC1984	150p	2SC2542	300p	2SC3026	550p	2SC3502	100p	2SD549	120p	2SD1065	160p	2SD1455	250p	2SK147	160p
2SC454	15p	2SC1398	55p	2SC1985	100p	2SC2545	55p	2SC3030	300p	2SC3503	50p	2SD551	300p	2SD1069	150p	2SD1457	165p	2SK150	150p
2SC458	10p	2SC1400	50p	2SC1986	100p	2SC2546	25p	2SC3037	125p	2SC3504	120p	2SD555	500p	2SD1071	450p	2SD1459	120p	2SK163	40p
2SC460	10p	2SC1403	500p	2SC2001	15p	2SC2547	65p	2SC3038	125p	2SC3505	240p	2SD560	50p	2SD1073	350p	2SD1468	60p	2SK168	40p
2SC461	15p	2SC1407	50p	2SC2002	15p	2SC2550	50p	2SC3039	80p	2SC3506	250p	2SD571	20p	2SD1088	150p	2SD1479	200p	2SK176	800p
2SC495	45p	2SC1413	150p	2SC2003	20p	2SC2551	70p	2SC3040	260p	2SC3507	650p	2SD575	530p	2SD1094	520p	2SD1487	225p	2SK192	45p
2SC496	25p	2SC1419	50p	2SC2004	20p	2SC2552	60p	2SC3042	300p	2SC3509	750p	2SD600	30p	2SD1110	225p	2SD1491	100p	2SK195	150p
2SC497	85p	2SC1429	50p	2SC2021	10p	2SC2553	200p	2SC3057	150p	2SC3518	120p	2SD601	40p	2SD1111	20p	2SD1494	300p	2SK197	140p
2SC515	100p	2SC1444	275p	2SC2022	110p	2SC2555	120p	2SC3058	2500p	2SC3519	250p	2SD602	60p	2SD1113	225p	2SD1496	350p	2SK214	170p
2SC535	30p	2SC1446	55p	2SC2023	180p	2SC2562	90p	2SC3068	60p	2SC3531	225p	2SD612	50p	2SD1128	200p	2SD1497	230p	2SK216	200p
2SC536	20p	2SC1447	70p	2SC2026	30p	2SC2563	200p	2SC3070	35p	2SC3549	200p	2SD613	70p	2SD1133	100p	2SD1497-02	350p	2SK218	400p
2SC558	275p	2SC1448	100p	2SC2027	200p	2SC2564	230p	2SC3074	200p	2SC3552	300p	2SD636	10p	2SD1135	75p	2SD1505	120p	2SK240	140p
2SC563	120p	2SC1449	120p	2SC2028	75p	2SC2565	260p	2SC3075	150p	2SC3568	200p	2SD637	15p	2SD1138	50p	2SD1507	60p	2SK312	750p
2SC605	100p	2SC1450	200p	2SC2029	120p	2SC2568	120p	2SC3077	120p	2SC3584	200p	2SD638	15p	2SD1140	40p	2SD1509	100p	2SK315	70p
2SC619	100p	2SC1454	250p	2SC2037	50p	2SC2570	30p	2SC3086	150p	2SC3595	220p	2SD639	20p	2SD1142	350p	2SD1511	100p	2SK320	120p
2SC641	80p	2SC1470	120p	2SC2053	120p	2SC2571	350p	2SC3089	130p	2SC3605	60p	2SD640	350p	2SD1148	175p	2SD1519	250p	2SK323	130p
2SC644	10p	2SC1472	40p	2SC2055	150p	2SC2577	110p	2SC3101	750p	2SC3606	100p	2SD655	18p	2SD1159	90p	2SD1521	70p	2SK386	600p
2SC647	300p	2SC1473	15p	2SC2058	20p	2SC2578	170p	2SC3112	35p	2SC3607	150p	2SD661	60p	2SD1160	150p	2SD1541	350p	2SK405	450p
2SC681	250p	2SC1474	45p	2SC2060	60p	2SC2579	110p	2SC3114	40p	2SC3636	280p	2SD666	25p	2SD1163A	220p	2SD1548	450p	2SK413	500p
2SC683	35p	2SC1475	60p	2SC2061	75p	2SC2580	175p	2SC3116	75p	2SC3657	400p	2SD667	20p	2SD1164	75p	2SD1554	170p	2SK415	500p
2SC708	100p	2SC1505	80p	2SC2068	60p	2SC2581	175p	2SC3117	120p	2SC3659	600p	2SD668	120p	2SD1168	270p	2SD1555	170p	2SK429	180p
2SC710	15p	2SC1507	45p	2SC2071	140p	2SC2588	600p	2SC3122	50p	2SC3668	120p	2SD669	35p	2SD1169	280p	2SD1556	400p	2SK511	450p
2SC711	15p	2SC1509	35p	2SC2073	40p	2SC2590	40p	2SC3148	185p	2SC3675	100p	2SD673	350p	2SD1173	350p	2SD1564	100p	2SK513	325p
2SC730	350p	2SC1514	35p	2SC2075	60p	2SC2591	50p	2SC3149	180p	2SC3678	280p	2SD676	250p	2SD1185	400p	2SD1565	75p	2SK531	350p
2SC732	40p	2SC1515	60p	2SC2078	95p	2SC2592	200p	2SC3150	125p	2SC3679	140p	2SD716	80p	2SD1186	400p	2SD1571	170p	2SK534	700p
2SC733	15p	2SC1520	45p	2SC2085	100p	2SC2603	10p	2SC3151	230p	2SC3680	380p	2SD717	180p	2SD1187	250p	2SD1572	100p	2SK537	900p
2SC735	40p	2SC1541	110p	2SC2086	60p	2SC2610	60p	2SC3152	130p	2SC3685	450p	2SD718	85p	2SD1189	55p	2SD1576	250p	2SK538	350p
2SC738	15p	2SC1545	120p	2SC2092	100p	2SC2611	30p	2SC3153	175p	2SC3687	600p	2SD722	240p	2SD1190	150p	2SD1577	250p	2SK539	1100p
2SC739	150p	2SC1567	40p	2SC2094	1200p	2SC2621	70p	2SC3156	350p	2SC3688	550p	2SD725	270p	2SD1191	120p	2SD1579	120p	2SK555	400p
2SC761	110p	2SC1568	35p	2SC2097	2300p	2SC2625	190p	2SC3157	200p	2SC3692	150p	2SD734	15p	2SD1192	90p	2SD1589	60p	2SK556	500p
2SC762	150p	2SC1569	55p	2SC2099	2500p	2SC2626	600p	2SC3158	260p	2SC3715	480p	2SD741	120p	2SD1196	150p	2SD1590	100p	2SK557	400p
2SC783	85p	2SC1570	40p	2SC2118	1100p	2SC2631	20p	2SC3159	200p	2SC3717	120p	2SD743	130p	2SD1197	150p	2SD1591	310p	2SK566	475p
2SC790	50p	2SC1571	50p	2SC2120	10p	2SC2634	10p	2SC3164	350p	2SC3729	450p	2SD756	100p	2SD1207	40p	2SD1593	125p	2SK695	550p
2SC792	380p	2SC1573	25p	2SC2131	550p	2SC2636	40p	2SC3169	150p	2SC3746	100p	2SD757	120p	2SD1210	280p	2SD1595	160p	2SK719	300p
2SC805	225p	2SC1580	600p	2SC2141	60p	2SC2637	120p	2SC3170	300p	2SC3747	120p	2SD758	140p	2SD1211	120p	2SD1608	210p	2SK724	600p
2SC828	20p	2SC1583	25p	2SC2153	40p	2SC2640	1800p	2SC3173	180p	2SC3752	250p	2SD762	100p	2SD1218	75p	2SD1609	70p	2SK725	600p
2SC829	15p	2SC1586	540p	2SC2166	80p	2SC2653	100p	2SC3175	150p	2SC3781	150p	2SD763	140p	2SD1223	75p	2SD1632	500p	2SK727	800p
2SC839	20p	2SC1617	340p	2SC2168	120p	2SC2654	180p	2SC3178	175p	2SC3783	300p	2SD768	180p	2SD1225	120p	2SD1637	50p	2SK735	600p
2SC870	100p	2SC1623	50p	2SC2188	70p	2SC2655	75p	2SC3179	70p	2SC3787	100p	2SD772	200p	2SD1227	40p	2SD1647	40p	2SK758	300p
2SC898	275p	2SC1624	60p	2SC2200	250p	2SC2656	550p	2SC3181	200p	2SC3789	75p	2SD773	20p	2SD1229	250p	2SD1649	260p	2SK787	900p
2SC930	15p	2SC1626	55p	2SC2221	650p	2SC2660	100p	2SC3182	120p	2SC3790	120p	2SD774	30p	2SD1237	300p	2SD1650	180p	2SK794	500p
2SC941	15p	2SC1627	15p	2SC2228A	60p	2SC2665	200p	2SC3199	40p	2SC3795	175p	2SD777	400p	2SD1246	20p	2SD1651	150p	2SK872	650p
2SC943	160p	2SC1628	75p	2SC2229	15p	2SC2668	10p	2SC3209	120p	2SC3798	220p	2SD784	650p	2SD1247	40p	2SD1663	450p	2SK903	500p
2SC944	140p	2SC1634	50p	2SC2230	80p	2SC2671	100p	2SC3210	550p	2SC3807	120p	2SD786	100p	2SD1248	270p	2SD1666	90p	2SK1057	600p
2SC945	10p	2SC1669	100p	2SC2233	100p	2SC2681	170p	2SC3211	220p	2SC3811	80p	2SD787	20p	2SD1251	180p	2SD1667	120p	2SK1058	800p
2SC950	40p	2SC1674	15p	2SC2235	60p	2SC2682	70p	2SC3212	260p	2SC3832	200p	2SD788	30p	2SD1263	90p	2SD1668	120p	2SK1117	250p
2SC959	225p	2SC1675	90p	2SC2236	20p	2SC2688	27p	2SC3225	50p	2SC3833	250p	2SD789	20p	2SD1264	55p	2SD1677	300p	2SK1118	225p
2SC980	40p	2SC1678	80p	2SC2237	540p	2SC2690	60p	2SC3244	45p	2SC3853	220p	2SD792	400p	2SD1265	75p	2SD1730	350p	3SK45	100p
2SC982	20p	2SC1683	100p	2SC2238	45p	2SC2705	50p	2SC3246	50p	2SC3854	250p	2SD794	33p	2SD1266	180p	2SD1732	400p	3SK51	100p
2SC983	120p	2SC1684	30p	2SC2240	15p	2SC2710	50p	2SC3259	350p	2SC3855	220p	2SD795A	140p	2SD1267	55p	2SD1739	275p	3SK59	100p
2SC1000	20p	2SC1685	30p	2SC2258	30p	2SC2712	20p	2SC3260	220p	2SC3857	500p	2SD811	450p	2SD1271	55p	2SD1740	125p	3SK74	50p
2SC1001	950p	2SC1729	900p	2SC2259	60p	2SC2716	50p	2SC3261	230p	2SC3858	550p	2SD819	200p	2SD1271A	225p	2SD1748	90p	3SK77	50p
						2SC2719	25p	2SC3262	280p	2SC3870	200p	2SD820	250p	2SD1272	200p	2SD1760	80p	3SK81	50p
						2SC2721	120p	2SC3263	280p	2SC3883	280p	2SD821	550p	2SD1273	50p	2SD1762	50p	3SK85	160p
						2SC2738	200p	2SC3264	390p	2SC3884A	300p	2SD822	290p	2SD1275	50p	2SD1773	160p	3SK88	70p
						2SC2740	450p	2SC3269	50p	2SC3886A	400p	2SD826	30p	2SD1276	60p	2SD1783	100p	3SK121	150p
						2SC2749	350p	2SC3270	50p	2SC3890	150p	2SD836	60p	2SD1277	190p	2SD1796	180p		

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REPLACEMENT VIDEO HEADS

Model	Price
AIWA	
AV66/AV77	1200p
G700	1100p
G900	1500p
AKAI	
VS105, 112, 115, 116, 125, 126, 201, 202, 205, 220, 240, 244, 245, 247, 248, 250, 301, 303, 304, VSP8, VSP82	1000p
VP7100, VS9300, VS9500, VS9800	650p
VP77, VP88, VP7100, VP7200, VS9700, VS9800	1200p
VS1, VS2, VS3, VS4, VS5, VS10, VSP1	1350p
VS33, VS35, VS37, VS38, VS53, VS55, VS66, VS765, VS767, VS768	2100p
VS512, VS515, VS516	2800p
VS465	2300p
VS11, VS12	1200p
VS6, VS8, VS9	2400p
VSX9	2250p
VSF600, VSF650	3600p
VS155, VS165	2300p
VS20, 22, 24, 25, 26, 27, 422, 426, 427, VSF10, VSP9	1250p
VSR9	1300p
VS109, VS603, VS606, VS607	2500p
VS75	2500p
ALBA	
VCR4000, VCR5000, VCR6000	1650p
AMSTRAD	
VCR4500, VCR5200, VCR9000, TVR1	900p
VCR7000	1000p
VCR6000, 6100, 6200, 8600, 8602, 8700, DD8900, 8904, TVR4	1100p
TVR2, TVR3, VCR4600, VCR4600 MKII, VCR4700	1100p
AUTHENTIC	
N850	800p
AWA	
ATVI	800p
BAIRD	
8900, 8901, 8902, 8903, 8906, 8922, 8928	650p
8904, 8923, 8924, 8925, 8929, 8935, 8943, 8944	650p
8909, 8912	800p
8930, 8931, 8933, 8940	800p
8942	2300p
8945	2000p
8947, 8948	1600p
8950	1700p
VC141L	3000p
VH582	7000p
BLAUPUNKT	
RTV100, 200, 202, 211, 214, 222, 224, RTX100, 200	800p
RTV301, RTX250, RTV333	800p
RTV306, 307, 309, 311, 315, 316, 520, 707	1650p
RTV310, 311A, 312, 317, 319, 320	1100p
RTV324, RTV325	1550p
RTV328	1850p
RTV424	3500p
RTV434, RTV444	3900p
RTX260, RTX720, RTV330	2300p
RTV454, RTV740	5000p
RTV478	3700p
RTV520, RTV530	1800p
RTV535, RTV560, RTV570	2000p
RTV635, RTV660, RTV670, RTV730	3000p
CR1000, CR1200, CR1500	4650p
CR1800	4100p
RTV321, RTV322	1700p
RTV338	2800p
RTV348	2700p
RTV404, RTV414	3000p
RTV640	3000p
RTV750, RTV800, RTV900	3500p
RTV810	4400p
RTV910	4500p
BOSCH BAUER	
VRH50	1000p
VRP20	1000p
VRP25	1000p
VRP30	3350p
CANON	
VR10	1000p
VR30A, VR30B, VR30E, VR40A	3350p
DAEWOOD	
912, VCR12, VCR30, VCR32, VCR50, VCR52	1800p
VCP11 RAF	1800p
DECCA	
8300	1000p
8400, 8500	650p
DUAL	
EVR101	2300p
VR70, VR71, VR74, VR81, VR90, VR91	650p
VR85, VR96	2300p
VR97	3300p
VR80, VR92	650p
VR93	2450p
EDISON	
VC2130, 2133, 2135, 2140, 2830, 2930, 2932, 2934, 3122	650p
VK2132, VK2512	2300p
VK2436, VK2340	650p
VK2530, VK2532, VK2631, VK2541	1600p
VK2632	1700p
VK2637	3050p
VKH2545	2450p
VKH2639, VKH2439	3300p
FUNAI	
E11, 1100, VIP1000, 1400, 3000, 5000, VCR4000, 4500, 4800, 5200, VCR5600, 6400, 6600, V1, V25	1100p
VCR4600, VCR5400, VCR5800	1200p
VCR5480, 5843, 8007, VIP2500A, 3000A, 6000, 150	2000p
VCR4530, VCR6000, VCR6100, VCR6800, VCR6803	1300p
VCR8103, VCR8107	2200p
VIP300A MKII	1900p
FISHER	
FVHP420, 510, 520, 530, 615, 618, 620, 622, 710, 711, 715, 720, 721, 722, 730, 830, 905, 906, 908, 910, 911, 915, 916, 918, 5000, 5001, 5005, 5050, 5075	1100p
VBS3500, 7100, 7500, 7600, 9900, VBR330	1800p
VBS7000, VBS7100, VBS9000	2000p
FVHP500, 711, 715, 721, 722, 730, 830, 5100, FVHD720	1100p
FVHP725, 830, 980	2500p
FVHP990	2700p
FVHP975	2400p
FVHD40, FVHD140, FVHP1, FVHP10, FVHP20	1150p
FIDELITY	
HQS200, VCR600, VCR6100, VR900, VR9100	1500p
VCR100	1100p
VTR1000	1100p
GOLDSTAR	
8000 3HSSDB	1900p
GVH51, GVH122, VCP4000, VCP4100, VCP4200	1100p
GHV1232, 1233, 1241, 1242, 1243, 1244, 1245, 1246, 1290, 1291, 1295, 1296, 1891, 8210, 8215, GVHP1240, 1241, 1247, 1248, VCP400, VCP4130, 4300, 4301, 4305, 4306, 4310, 4311, 4315, 4316, 4320, 4321, 4326	1100p
G.E.C.	
4000H, 4001H, 4002H	1200p
V4001H, V4004	1200p
V4005H	1500p
GRANADA	
CS1, DS2	1600p
VHSAH1	1100p
VHSAH3	2400p
VHSAN3	800p
VHSAY3	1200p
VHSBH1, VHSCH1	2100p
VHSBP1	850p
VHSBY3	2600p
VHSD52	1600p
VHSEH2	1600p
VHSEY1, VHSEY2	1400p
VHSFG2, VHSFG4	1300p
VHFS1, VHSFS2	1300p
VHSTJ1, VHSTJ2, VHSTJ3, VHSWJ3, VHSYJ2	700p
VHSVH4, VHSWH1, VHSXH1, VHSYH2	1600p
VHSWJ1, VHSXJ3	700p
GRAETZ	
4312, 4605, 4905, 4912, 4913, P4833, TR4605, TR4812, TR4905, TR4912, TR4913, TR4914, TR4943	650p
4935, 4943, 4963, 4985, 4993, TR4833, TR4935, TR4985, TR4993	650p
4920, 4927, 4930	1700p
4946, TR4906, TR4916	1600p
TR4994	2300p
TR4995	3300p
GRUNDIG	
VS410, 450, 460, 500, 505, 510, 520, 521, 530, 546	1600p
BARCELONA, MVS400, 440, 500, 600, SE5100, 6100, 6110, 9100, TVR4500, 4510, 5510, VS400, 440, 500, 505, 510, 518, 600, 610, 5180, VS6190, 700, 900	1400p
MADRID, SE5140, VS540, VS5480	3000p
MVS550, 620, VS550, 620, 630, 640, 790, 930, 940	2400p
VS120	2300p
VS680	4600p
VS160, VS740	4400p
VS170	4600p
MVS660, SE6160, VERONA, VS660, VS6690	3500p
MVS710, 720, 910, SE7120, 9120, VS710, 720, 800, 810, 910, 920	1700p
HINARI	
VXL2, 3, 4, 20, 35	1000p
VXL5, V20H	1050p
VXL6	1200p
VXL7	1300p
VXL8, 9, 10, 11, 90, VCR34H, VTV200	1100p
HITACHI	
VT11, 14, 15, 16, 30, 33, 34, 330, 340, 503, 640, 5030, VTP10, 30	1000p
VT7, VT17, VT18, VT19	2200p
VT35, VT38, VT39	2400p
VT100, 110, 111, 112, 113, 115, 118, 120, 125, 128, 220, 225, 400, 405, 410, 413, 414, 415, 418, 510, 518, 520, 525, 526, VTM625, 626, 725, 726, 728	1400p
VT3000	650p
VT4000, 4200, 5000, 5500, 5600	1100p
VT77, 680, 6500, 6700, 6800, 7000, 8000, 8030, 8040, 8100, 8300, 8500, 8700, 9000, 9300, 9500, 9700, 9900	1000p
VT8, 9, 56, 57, 570, 575, 576, 580, 585, 588	3200p
VT65	2400p
VT130, 135, 138, 145, 250, 255, 258, 420, 425, 426, 428, 430, 431, 435, 438, 535, 536, VT130, 301, VTM630, 635, 636	1900p
VT52, VT60, VT61E, VT62E, VT63, VT64, VT640	1200p
VT168, VT150, VT260, VT498 (4 HEAD)	2300p
VT530	2050p
VT522, VTM620, VTM622, VTM720, VTM722, VTM822	1650p
VT660E	2600p
H.M.V.	
HV1000, HV2000, HV3000 HV4000, HV7000, HV8000p	650p
I.T.T.	
VR3605, 3905, 3935, 3943, 3954, 3958, 3985, 3993, 4993	650p
VR3833, 3912, 3913, 3914, 3963, 3975, 4913, VRP3833	650p
VR3986	2000p
VP3826, 3906, 3916, 3926, 3946, 3948	1550p
VR3927	1400p
VR3976	2300p
VR3977	2700p
VR3984, VR3994	2300p
VR3995, 3997	1800p
VR3917	1400p
VR3730, VR3731, VR3749	2500p
VR3918, VR3919, VR3938	1500p
VR3520, 3701, 3719, 3720, 3721, 3759, 9720	2000p
VR3907, VR3908	1600p
VR3968	700p
J.V.C. & FERGUSON	
HR2200, 3300, 3320, 3330, 3350, 3360, 3660, 3750, 3860, 4100, 3292, 8900, 8901, 8902, 8903, 8906, 8922, 8928, 3V01, 3V06, 3V22	600p
HR3660, 7600, 7610, 7650, 7700, HRD110, 111, 120, 121, 220, 225, HRS100, 8904, 8923, 8924, 8925, 8929, 8935, 8941, 8943, 8944, 3V16, 3V23, 3V24, 3V31, 3V35, 3V36, 3V38, 3V39, 3V49	625p
BR1600, HRD140, 141, 142, 143, 150, 152, 156, 157, 158, 160, 5101, HRS10, 8947, 8948, 3V42, 3V44, 3V45, 3V46, 3V47, 3V52, 3V54, 3V55, 3V56, 3V57	1150p
HRD154, 170, 171, 210, 211, 217, 320, 321, 350, 521, 522, 525, 526, 527, 550, 8950, 8951, 3V64, 3V65, FV10, FV11, FV20, FV21, FV26	1300p
HRD565, HRD566, 3V48	2200p
HRD725, HRD755, 3V43, 3V53	2950p
8930, 8931, 8933, 8940, 3V29, 3V30 8945	700p 2400p
3V00, 8902, 8903, 8909, 8912, 8922 FV31	1000p 1500p
FV37, FV43H, HRD860	3500p
BR7000E, BR7000S	2600p
HR7200, 7300, 7350, 2650, BR6200	700p
HRD455	2000p
HRD520	1400p
HRD300, 400, 580, 600, 620, 650	2300p
HR4100	1000p
HRD750, HRD830	3300p
HRD250, HRD257	2500p
3V32, 8942, HR7655	2200p
HRD180, 190, 230, 610, 3V59, FV12L, FV20B, 26, 30, 32, 33, VC141L	2250p
HRD370, HRD430, HRD470, 3V58, FV13H	2300p
HRD530, HRD700, FV14T	3100p
GRC1, GRC2, 3V41	2800p
HRD330, 337, 440, 637, 641, 660, HRFC100, FV44L	2100p
KENWOOD	
KV901, KV903, KV905	650p
KV917	2450p
LOGIK	
VR960	1500p
VR950	1400p
LOEWE	
OC410, OC420, OC440	2400p
OC50, OC55, OC60, OC65	1500p
LUXOR	
9225, 9256	1800p
9245, 9251, 9254	1225p
9270, 9271, 9273	1800p
9272, 928217	2700p
9252	2500p
928017, 928077, 928097, 929107, 928117	1700p
9253	2500p
9281	2700p
9284, 9295, VR3701, VR3721, VR3731, VR3761	2100p
MATSUI	
VX500E, 800A, 810A, 820, 80A, 770B, 773B	1200p
VCRL3, VX730, VX750	1450p
VX735, VX755, VX990	1500p
VX735A, VX765, VX850	1750p
VX600	1100p
MITSUBISHI	
HS303, HS304, HS320, HS700	1500p
HS306, HS318, HS710	1500p
HS307	2300p
HS319	2300p
HS330	2400p
HS400	2250p
HS349, HSE31, HSE32, HSB31	2250p
HS411	2900p
HSE30, HSB30	2100p
HS338	2200p
HSE10, HSE11, HSE20, HSE21, HSE41, HSB10, HSB20	2100p
HS300, HS301, HS302, HS310, HS273	1450p
HS200	650p
HS337, HS347	1400p
HSE12, HSE22, MX1	2100p
HS411EZ, HS411GZ	2900p
HSB11, HSB21	2100p
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Not much cheer

News in the brown goods field has been pretty dismal of late. Take Philips, which seems to be a perennial walking wounded case. The company had appeared to be on the mend after a worldwide cost-cutting programme which was started five years ago when Jan Timmer took over as chairman. But, following a sharp profits fall, with the company's first quarterly loss since 1992, a further shake up is being undertaken. The difficulty is that the company operates in a mature market, in which prices are falling at an annual rate of six per cent. Manufacturers are competing by cutting costs to gain a larger share of static demand. It's not a situation in which any firm that does its own manufacturing can achieve much.

Philips' latest plan involves an overall loss of 6,000 jobs in its consumer electronics business, with far greater reliance placed on a group of external suppliers which are referred to as "a cluster of dedicated subcontractors". This is an approach that was pioneered many years ago by major Japanese manufacturers. Rather than make everything yourself, you rely on subcontractors who, in return, rely on you for their main source of work. It is hardly a cosy arrangement: the whole point seems to be that the major firm can exert pressure on its subcontractors, thereby – in theory – achieving optimum efficiency and cost-effectiveness. What happens when lower and lower prices are demanded for subcontracted work is not made clear. The whole edifice could collapse. However that might be, this is the course on which Philips has now embarked. The company is also to carry out distribution, sales and marketing on a regional rather than a national basis, and has said that it will not support Grundig's losses after this year. But Philips' chief financial officer Dudley Eustace has said that it has "no intention of abandoning the television and audio business".

One has to assume that the subcontracting will also be done on an international basis, as major Japanese firms have had to do. There is a sense of déjà vu about this, though one wishes Philips well – it is still one of the major contributors to research and development in our industry.

Toshiba, which has also just appointed a new top man, Taizo Nishimoro, provides an interesting contrast. Mr Nishimoro thinks that the western emphasis on sales and marketing rather than engineering is the way to go. So the whole industry seems to be moving full circle. Taizo Nishimoro has become the first non-engineering president of Toshiba. Where the company cannot compete effectively on its own, he intends to seek international alliances or go for closures. He put it as follows. "The technology and the businesses we are engaged in are getting more complex. In these circumstances, if we try to do everything ourselves we are making a mistake." Here's how Minoru Makihara, who became head of Mitsubishi Corporation four years ago, sees it. "Technologies are now moving so fast that it is impossible for the top manager to know all the details. Companies are now looking for generalists who can understand broad changes, delegate and provide leadership." Corporate change indeed amongst our oriental colleagues.

Major firms the world over are facing similar problems and having to adopt similar policies. In a mature market such as consumer electronics, you have to rely on marketing to squeeze the last little bit of advantage from such developments as Dolby sound and other added value features.

The consumer electronics industry has been hoping that the digital video disc would come to its aid and get sales and profits moving ahead. The DVD was due to be released this month, but we are unlikely to hear much more about it yet awhile. There's no problem with the technology: the difficulty is with licensing and software. There is obviously no point in launching it without adequate software support. But the movie companies, which control most of the required supply of software, are concerned that a recordable version of the disc, due in a couple of years' time, would be a gift to pirates worldwide. Concessions have been made by the electronics industry, in particular that different disc formats should be used in different parts of the world. But a curious problem has arisen. The other main use of the DVD is as a ROM in computer systems. For this application flexible copying facilities are a major requirement. But the movie companies are unwilling to agree to this. At present the situation is deadlocked and the great hope of an autumn launch, all important for sales, has had to be postponed. Next year maybe? It's a great pity, since the DVD has much to offer.

There's a lot of sad news on the retail side as well. Colorvision has been placed in administrative receivership, with a threat to 800 jobs at its 76 stores, while the Rumbelows shops that were taken over by computer retailer Escom have suffered a similar fate. The receivers have closed down the UK chain with the loss of 850 jobs at some 150 stores.

Nothing seems to be going right just now.

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TELETOPICS

Digital set-top box technology

The BBC has asked the government to license digital set-top box technology to ensure that universal decoders become available for digital TV services from satellite, cable and terrestrial sources. It wants digital operators to declare in advance the conditional access system they propose to use, and legislation to guarantee that the industrial property rights for the manufacture of a decoder box and encryption system are offered under licence to all manufacturers and broadcasters on fair, non-discriminatory terms. The legislation should, the BBC adds, be enforced by Oftel, with the ITC given extra powers to ensure digital standardisation.

In a move endorsed by the BBC and the ITC, the Voice of the Listener, the National Consumers Council and the Consumers' Association have written to Ian Lang, the President of the Board of Trade, asking for standardisation of digital TV equipment. Major European pay-TV companies have met the European industry commissioner Martin Bangemann to discuss the prospects of a single digital decoder. The meeting included Bertlesmann, BSkyB, Canal Plus, CLT, Deutsche Telekom and Vebacom.

Meanwhile BSkyB has sent a confidential digital decoder specification to manufacturers and has said that it expects decoders to be available in quantity by September 1997, when it proposes to launch a 200-channel UK satellite TV service. The company is considering expansion to 500 channels in the longer term, giving near video-on-demand in addition to a large number of different channels. BSkyB's decoder specification includes forecasts on decoder demand in each year following the start of its service. There are no plans to appoint exclusive manufacturing rights. BSkyB is particularly interested in the prices that manufacturers can suggest. It hopes that the decoder boxes can be made available for around £200. The specification is understood to include compatibility with terrestrial TV services.

BSkyB has been in touch with various groups, including British Telecommunications and Barclays Bank, to establish whether they would be prepared to subsidise the initial retail cost of the decoder boxes in return for an involvement in developing interactive services such as home shopping and banking.

It seems that the two leading digital satellite TV groups in Germany, Kirch and Bertlesmann, have reached agreement on a standard digital TV decoder. The two groups had previously been working on the technology separately. Kirch's service, DF1, in which BSkyB has a 49 per cent stake, is already in operation. Bertlesman plans to start its digital TV service this autumn.

The Konig DKM190 digital capacitance meter, which is available from SEME Ltd., Unit 2, Saxby Road Industrial Estate, Melton Mowbray, Leicestershire LE13 1BS (phone 0166 465 392, fax 0166 463 976). The newly-developed meter can check capacitance values from 1pF to 20,000μF with an accuracy of 5 per cent. It comes complete with carry bag, test leads, 9V battery, fuse and instruction manual for £73.

Latest news on Channel 5

Channel 5 Broadcasting is to employ some 7,000 engineers to carry out retuning in areas where the service will use ch. 37. Retuning has already started and is expected cost rather more than C5B originally estimated – the figure is now put at around £70m. Following the trial run covering an area of 10,000 houses in Wallington, Surrey, C5B has conceded that its original plan required amendment.

The retuning exercise will be backed by an extensive advertising campaign which will include 3,000 "Give Me 5" posters and promotions in Blockbuster Video and Thorn and Granada rental outlets. Retuners will wear a branded uniform and carry a special identity card. C5B has reached an agreement with the Association of Chiefs of Police to vet all retuners to ensure that none have a criminal record.

A seminar on C5 was held at the Confederation of Aerial Industries' recent trade fair. The CAI has a video of the seminar available at £15 plus VAT. The CAI can be contacted at Fulton House Business Centre, Fulton Road, Wembley Park, Middx HA9 0TF (phone 0181 902 8998, fax 0181 903 8719).

Multiview (UK) Ltd.,12 Thorkhill Road, Thames Ditton, Surrey KT7 0UE (phone 0181 398 6663, fax 0181 398 0177) has launched two products to help with Channel 5 retuning problems, a signal generator and a "tune in module". The signal generator, which has a trade price of about £150, generates a test pattern and has one button preset to ch. 37. The tune in module is an external modulator for use where existing equipment has a limited tuning capability. It has a tuning range of ch. 32-49 and is preset to channel 44. There are two versions, for use with satellite IRDs and VCRs. The former has a trade price of about £11 and uses the LNB supply. The latter, with a trade price of about £13, uses an external power supply.

Terrestrial digital TV trial

The BBC, BT and Pace Micro Technology are conducting live trials of a terrestrial digital multiplex TV system, claimed to be the first working system of its type in the world, using the Crystal Palace and Pontope Pike transmitters. BBC-1, BBC-2 and BBC World are being transmitted as a multiplexed digital signal that includes data for an electronic programme guide. The signals conform with the relevant European standard and are being received using prototype receivers developed by Pace in conjunction with BBC Research and Development – the trial service will not be made available to the public. BT is using the transmissions to test interactive services.

The test transmissions started with widescreen coverage of Trooping the Colour.

Business news

Philips is to reorganise its consumer audio and video businesses with a loss of some 6,000 jobs. The idea will be to employ a group of external specialist producers for capital-intensive parts of its manufacturing operations. Distribution, sales and marketing will also be affected – they will be run on a regional basis. As an example of what will be involved on the manufacturing side, there's a plan to reduce the number of current TV chassis from twenty five to just six.

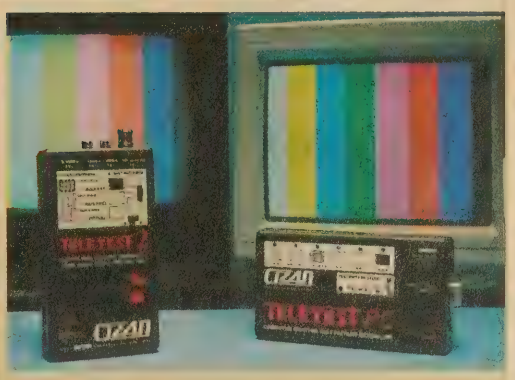
The company has emphasised that it has no intention of abandoning the television and audio fields – an interactive TV set that gives access to the Internet is to be launched in the USA this October.

Talks that were to lead to a take-over of Amstrad's digital telephone business by Psion, the hand-held computer manufacturer, have been called off following consideration of a report from the company's financial advisers.

The Lit-On Technology Corporation of Taiwan, which is the world's fifth largest computer monitor manufacturer, is to build its first European plant in Lanarkshire, creating over 1,000 jobs in the next two years. Planned output is a million units a year. The recent decision by fellow Taiwanese company Chunghwa Picture Tubes to establish a plant in Lanarkshire contributed to Lit-On's decision.

Magneto-optical discs

Fujitsu plans to start production of a new generation of computer memory discs with increased storage capacity next year. The magneto-optical discs will mainly challenge the DVD-ROM disc, which is due to become available next year. Fujitsu's discs will be able to store between 6-7Gbytes of data, which can include video, in comparison with the DVD-ROM's 2·6Gbytes. The company hopes that the discs will be used for multimedia services such as video-on-demand and interactive TV. Seven other electronics companies, including Hitachi, Philips, Sharp and Sony, are to manufacture the discs.



Teletest for PC Monitors

The newly-released Teletest PC monitor test pattern generator (right), which is available from Ozan at £149.95 plus VAT. This makes it cheaper and more convenient than carrying a second-hand computer around! Hand-held and battery powered, the Teletest PC generates six different test patterns and plugs into the monitor directly.

Ozan has also relaunched the Teletest 2 test pattern generator (left) for TV sets and VCRs. It now provides six test patterns with S video as well as composite video, RF and line AV outputs.

For a free information pack, Freecall Ozan on 0500 009 070 – or check out the new web page at ozan.co.uk.

Sharp's Surround Sound

In addition to models that feature Dolby Pro-Logic Surround sound, Sharp is about to launch several models that use a surround sound system called SRS (Sound Retrieval System). This was developed by the Californian company SRS Labs. The system works by combining the left and right channels of a stereo signal to produce a sum signal (L + R) and also subtracts one signal from the other to create two difference signals (L – R and R – L). The processed sum signal includes all direct and centred sound (such as dialogue) and provides spatial information while the difference signals provide directional cues. The result is surround sound from a two-speaker system, with a wide listening area.

Sets using the system will be labelled "3-D Surround Sound". Models will include the 21in. 51CS05H at £430, the 25in. 59CS05H at £530 and the 28in. 66CS05H at £630 (suggested retail prices).

New Type Service Manual

The significant feature of the first of a new type of service manual just released by Grove Farm Publications is the fact that it has been prepared for the service industry by a service engineer (Steve Beeching). It covers most of the Grundig satellite receivers that were made in the company's UK factory between 1994 and 1996, including models in the Grundig, JVC, Matsui and Philips ranges, and was produced with the co-operation of Grundig International – for those who do not have a Grundig account.

The aim is to present the technical information in a way that will be of greatest help to service engineers, with technical specifications, circuit descriptions and block, circuit and layout diagrams. The circuit and layout diagrams are clear and are gridded so that the engineer can find what he wants with the minimum distraction while working on the equipment.

The manual costs £15 plus post and packing and represents good value. Enquiries to Grove Farm Publications, Grove Farm, Long Lane, Barnby In The Willows, Newark, Notts NG24 2SG (phone 01636 626 829, fax 01636 626 767).

Camcorner

Reports from David C. Woodnott and Eugene Trundle

Sanyo VMD3P

There was no viewfinder picture though the machine was otherwise OK. We traced the cause of the fault to leakage in the line drive coupling capacitor C9911. This was a very misleading fault, because the waveform at the base of the line output transistor seemed to be good while the waveform at its collector was ragged. This could lead one to suspect the line output transformer and its periperal components. **E.T.**

Canon E200E

This one came in because there was playback picture mistracking. The cause was a loose slant pole, something that's not uncommon with this model. It was easy enough to put right: we reset the pole's position, then secured it with a Loctite product. After this the machine seemed to work fine.

When we tested it however there was a problem at tape end. The machine entered the caution mode, with a flashing symbol in the viewfinder. No functions were available until the tape had been ejected and reinserted. At the end of rewind the same fault recurred.

This prompted a suspicion that the cassette LED had failed – rare perhaps, but not impossible. The lamp and the connecting ribbon cable were both OK however. Use of another camcorder to view the LED confirmed that it was working. What next? – there were still no outputs from the tape-end sensors. The only other item in the chain, the gooseneck baseplate which carries a clear plastic lens assembly to direct the light from the LED into the cassette, turned out to be the cause of the trouble. The plastic light-bending unit was deformed, probably because of heat during a previous soldering operation. Beware! **D.C.W.**

JVC GRM3F

There was no camera operation. This was simply because the camera head section had become detached from the deck section, no doubt as a result of an impact. Refitting the connector restored all functions. **D.C.W.**

Canon UC10E

Playback was OK with this 'upright' model, but there was no camera E-E picture. The cause of the fault lay with the sensor PCB assembly which, having a ceramic-based substrate, is unfortunately not repairable. Capacitor failure had caused print damage. The problem is becoming a serious one with models that use this form of construction. We've had similar faults with **Model E6E** and others. A new board is required, at around £120 trade! **D.C.W.**

Panasonic NVS500

All functions except for zoom and autofocus worked correctly. The cause of the fault was a damaged ribbon cable at the connection to the zoom motor, possibly the result of impact damage. A new cable put matters right. **D.C.W.**

Sanyo VEMS1P

As with several models these days, electrolyte leakage can cause various fault symptoms, necessitating replacement of all the surface-mounted can electrolytics on the main PCB. A quick check on the situation, without need to remove the case, is to examine the video signal waveform while playing back a previously recorded tape: note especially any rounding off or crushing in the sync pulse area – this is a sure sign that all is not well.

It's easy to get confused when replacing the capacitors in this model as there is an extra, marked space for a capacitor that's not fitted. Note this position before you start removing the old capacitors – the layout detail in the manual is not too clear (both sides of the PCB are shown as seen from the same side, requiring some mental agility in getting things right when you turn the board over). **D.C.W.**

Sanyo VMD90P

The reported fault was that the camera E-E picture flashed on and off erratically, and that an E-E picture was seen dimly even in the playback 'stop' mode, which is normally blank. Tape playback was OK. Internal inspection showed that the iris motor had moved from its normal position, doubtless because of an impact – it sits only a few millimetres behind the front of the case. We had to fit a new lens assembly, as the motor is not available separately. The result was a fairly expensive repair.

Note that the lens assembly for Model VMD90R has a different iris motor. A few days after this repair another Sanyo came in with an E-E picture showing in the VTR mode! Another lens unit was required. **D.C.W.**

Chinnon VC1500

Mechanical failures are common with this mechanism, which is very similar to the Amstrad VMC100 and various JVC decks. One we had in recently had failed during eject, and as a result had damaged the intermediate gear. The cause of the failure had been the spring plate beneath the take-up guide becoming loose. The mechanism had then jammed, causing the fault and the damage to the intermediate gear. Although the gear costs only a few pounds, you have to dismantle most of the loading ring gear and head drum assembly to fit it. Retiming is straightforward – in comparison with some later mechanisms! **D.C.W.**

Sony FX Series

For no power up, check the connections between the DC-DC converter and the main PCB. Impact damage can detach the socket pins from the PCB. **D.C.W.** ■

VCR BELT KITS / REPLACEMENT VIDEO LAMPS

Model	Price
HRD520, 600, 620, 637, 641, 650, 830	95p
HRD540, 550, 580, 660, 860, 960, HRS5800	130p
KENWOOD	
KV901	70p
KV903	90p
LOEWE	
OC11, OC40	95p
OC410, OC420, OC440, OC460	130p
OC50, OC55, OC60, OC65, OC70, OC75	120p
LOGIK	
VR955	180p
LUXOR	
9245, 9251	130p
9252	140p
9253	140p
9254	100p
9255	130p
9256	130p
9270, 9271, 9273, 9274	115p
9272, 9280	140p
9281, 9284, 9285, 9292, VR3701, 3721, 3731, 3761, 3781	95p
MATSUI	
VX850	75p
MITSUBISHI	
HS200	200p
HS300, 301, 302, 307, 310, 337, 338, 347, 349, 411, 412, 421, HSB10, 20, 30, HSE10, 20, 30, 70	150p
HS303, HS304, HS306, HS307, HS330, HS400, HS700	150p
HS318, HS319, HS410	130p
N.E.C.	
N830, N831, N832, N833	100p
N895	80p
PVC2300, PVC2400	180p
DX1000, 1600, 2000, 3000, N9012, 9013, 9014, 9016, 9033, 9034, 9053, 9054, 9055, 9066, 9110, 9120, 9510, 9520, 9530, 9610	95p
NATIONAL PANASONIC	
NV300, NV332, NV333, NV340, NV366	125p
NV777, NV788	100p
NV2000, NV2010, NV3000	130p
NV7000, NV7200, NV7800	95p
NV8600, NV8610, NV8620	145p
NV230, 250, 280, 430, 431, 433, 450, 460, 465, 470, 730, 770, 810, 870, 890, AG1000, 1050	125p
NV370, NV380, NV480, NV630, NV780, NV830, NV850	100p
NV600, NV688, AG6010, AG6015	110p
NVG7, 10, 12, 14, 15, 18, 30, 130, 400, NVH70	70p
NORDMENDE	
V100, V140	70p
V1000M, 1005M, 1205, 1215, 1235, 1245, 1305, 1403, 1405, V1500P, 1503, 1505K, 1805K, 2000D, 2405, 2500H, 3000H, V3405H, 3105, 4405H, 5000, 8005, 900, 905	65p
V1001, 1005, 1015, 1025, 1035, 1041, 1055, 1065, 1105, 3005, 304, 5005, 502, 503	80p
V101, V102, V103, V112, V141, V142, V301, V302	90p
V110, V333	110p
V1500T, V2000B, V2000P, V400H	95p
V250, V460, V9460, V20035542, V20035543	130p
V300, V303, V380	75p
V500	75p
ORION	
COMBI15000, 16000, NEVHM, TVP230RC, 900MVH1012, VH1030, 1040, 1060, 1070, 1100, 1120, 1440, 1500, 1660, 1800, 2150, 2308, 2400, 2500, 2600, 2700, 2960, 300, 358, 360, 362, 4010, 4015, 4016, 4020, 4300, 5010, 5015, 530, 535, 536, 630, 635, 640, 730, 735, VP220, 225, 245, VR1032, 2966, 2980, 821, 925, VXL25	30p
NEVHL, VCP, VH1204, 2004, 2204, 3050, 3060, 4008, 400, 4012, 412, 512, 600, 666, 744, 774, 7905, 800, 820, 900, 974, VP200, VR2949, 2956, 2957, VXL20	90p
VC150, 180, VH1000, 200, 201, 205, 212, 250, 254, 288, 300, 303, 3030, 312, 33, 3312, 404, 555, 700, 704, 708, 712, 770, 780, 844, 900, VHF2, VH3	80p
VH1, VH2A	150p
PHILIPS	
VR6460, VR6920	170p
VR6540	100
DV186, 286, 291, 292, 468, 471, 562, 571, 761, VR201, 202, VR20DV1, 20DV2, 20RW7, 25BO1, 25BO2, 302, 303, 305, VR30DV2, 35BO2, 35BO3, 635B7, 715B4, 715B5, 715B8, VR865B2, 915B2, 925B3, VR6180, 6185, 6285, 6290, 6291, 6293, 6367, 6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581, 6670, 6676, 6760, VR68SB4, 86SB1, 92SB2	85p
VR6442, VR6542	70p
VR2025, VR2580	100p
VR445B9, BR445B920, VR445B922, BR6843	100p
VR6548, VR6648, VR49SB620, VR644869S	110p
SABA	
VR6420, 6435, 6440, 6460, 6480, 6620, 6770, 7200, 8420, 2A10, 70, 2B20, 3B20, 4A10, 4B20, 6A10, 6A70, 6B20, 8B20	65p
VR6004, 6005, 6011, 6014, 7004, 7011, 7014, 8011, 8014, BERLIN	90p
VR2000, VR6000, VR6012, VR7000, VR7720, PVR6068	130p
VR5005, VHR7000	135p
VR6006, 6007, 6008, 6009, 6015, 9016, 9018, 6038, 7006, 7007, 7016, 7018, 9006	65p
VR6010, VR9010	70p
VR6020, VR6022, VR6023, VR6028, VR7730	75p
VR6024	75p
VR6520, VR6540, VR6560	90p
VR6710, VR6720, VR6735, VR8720	130p
VR6720, VR6730, VR6760, VR6775, VR6780	160p
SAISHO	
VR2000, VHL3	90p
VR3800	75p
SALORA	
SV6500	100p
SV6600	150p
SV8000	120p
SV8100	60p
SV8500, SV8520, SV9500	150p
SV7400, SV8400, SV8420, SV8550	120p
SV6700, SV8710, SV8750, SV9700	120p
SV6800, 6900, 8810, 8820, 8870, 8910, 8920, 8970	95p
SV8600, 8620, 8700, 8720, 8830, 9600, 9810	130p
SAMSUNG	
SV716, 717, V1616, V1621, V1626, VX616, VX617, VX619, VX626, VX627, VX629	85p
VB520, 510, 610, 616, 617, 619, 620, 626, 627, 629, VI510, 520, 611, 616, 621, 626, VX510, 520	100
VB900, VB910, V1900, V1910	110
PX980, 981, 982, SE9001, SV9001, SVX307, 319, 322, VB770, 8220, 8225, V1770, 790, 8220, 8225, VK8220, VPX31, VX750, VX790, 8220, 8225	135p
SVX301, 303, 305, SX7301, VB710, 971, V1730, 710, VX712, VX720, 730, 970, 971, 972	230p
VX9880	110p
SANYO	
VTC5000, 5150, 6000, 6500, VTCM10, 11, 20, 21, 30, 31, 50	75p
VTC5300, VTC5350, VTC5400, VPR5800	100p
VTC5500	95p
VTC9100, VTC9300	220p
VTC1100, 1300, 1500, 1100, 1150, 1200, 1300, 1500	90p
VHR2100, VHR2300, VHR2500, VHR2700	150p
VHR3100, 3300, 3310, 3400, 3700, 3800, VHRD500, 700	110p
VHR4100, 4150, 4200, 4300, 4350, 4770, 5100, 5200, 5300, 5350, 5700, 7100, 7200, 7500, 7530, 7540, 7800, 7810, 8100, 8200, 8250, 8500, VHRD4400, 4410, 4500, 4600, 4610, 4710, 4890, 6700	90p
SHARP	
VC200, 384, 385, 386, 388, 390, 9300, 9500, 9700	100p
VC7300, VC7700, VC7750, VC7800, VC8000	150p
VC8300	150p
VC300, 387, 471, 473, 481, 482, 483, 486, 488, 496, 8481	80p
VC402, 500, 571, 573, 581, 582, 583, 584, 585, VCSF3	80p
VC600, 651, 682, 684, 685, 693, 783, VC6F3, VC6V3	70
VC772, 779, 781, 782, 785, 786, 793, 800, 7810, 7822, VCA100, VCA102, 104, 131, 140, 170, 202, 203, 234, 501, 602, 5011, VCD806, 810, 815, VCH80, 865, 910, VC51000, VCT310, 410, VCT1314, VCTS312	115p
SIEMENS	
FM350, FM352, FM355	60p
FM484, FM485	55p
FM391, FM392, FM394, FM462	100p
FM461, FM464, FM468, FM561	150p
FM361, FM362, FM363, FM364	120p
SONY	
SLC6, SLJ10, SLT6ME	140p
SLC5, SLC7, SLJ7, SLJ9	140p
SLC9, SL8000, SL8080, SLT50	165p
SL8000E, SL8080E, SL8200, SL8600	175p
SLV255	95p
TELEFUNKEN	
VR400, VR410, VR440, VR449	130p
VR450, VR540, VR549, VR640	70p
VR520, VR529, VR620, VR920	70p
VR530, VR535, VR539, VR550, VR630, VR650	75p
A940, VR1925, 1930, 1940, 1950, 2960, 925, 930, 940, 950	90p
A920, VR1970, 1980, 2920, 2925, 2930, 2970, 7921, 7926, 7931, 7970, 7971, 7980, 970, 7981, 975, 980	65p
A1200, 930, 932, 935, 960, 980, 990, VR2931, 2935, 2941, 2971, 3935, 3945, 3950, 3965, 3975, 4935, 4940, 4942, 4945, 496, 5VR4970, 6000, 7932, 7959, 7979	65p
VR1935	100p
VR2915	90p
THOMSON	
SV1000, V410, 430, 450, 510, 520, 530, 540, 620, 630, 640, 4240, SV5540	65p
TX8000, V309, V357, VK411	75p
TX8500, V342, 343, 351, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, 5500, 6000, 8564	90p
V320, V321, V323, V326, V4200, V4300	90p
V333	100p
V340	90p
V4100, VK308, VK309, VK410	120p
VK300, VK301, VK302, VK303, VK305, VK3301	135p
VK312	65p
TOSHIBA	
V55, V57	85p
V33, V31, V51, V53, V9600, V9680	85p
V61, V63, V65, V66, V67	150p
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AKAI, GRANADA (VHSTJ2), HITACHI (VT3000), ITT (VR3912, VRP3833), JVC (HR2200, 3300, 3330, 3660), MITSUBISHI (HS200), TELEFUNKEN (VR510, 519, 610), THOMSON (VK300, 305, 306, 3301), FERGUSON (3V00, 16, 22, 24, 3292, 8900, 8901, 8902, 8903, 8909, 8912, 8922, 8925)	VL01	25p
BLAUPUNKT, ORION (VH1, 2A), NATIONAL (NV200, 2010, 3000, 7000, 8150, 8200, 8400, 8600, 8610, 8620), SHARP (VC2300, 6000, 6200, 6300, 7300, 7700, 8000, 8300)	VL02	40p
AKAI (VS10), GRANADA (VHSXJ3), ITT (VR3993, 3994), JVC (HR2650, 7600, 7610, 7650, 7655), TELEFUNKEN (VR530, 535, 539, 550, 630, 650), THOMSON (V309, 316, 357, VK309, 411, TX8000), FERGUSON (3V31, 8941, 8942)	VL06	40p
AUTHENTIC (N850), DECCA (VR8300), GRANADA (VHSTJ3, WJ1, WJ3), ITT (VR3913, 3914, 3963), JVC (HT7200, 7300, 7350, 7700), TELEFUNKEN (VR450, 520, 529, 540, 549, 620, 640, 920, 1920), THOMSON (V4100, VK308, 309, 312, 410), FERGUSON (3V23, 29, 30, 8923, 8924, 8929, 8930, 8931, 8940)	VL07	40p
GRANADA (VHSAY3), SHARP (VC200, 381, 384, 385, 386, 388, 390, 393, 9300, 9500, 9700)	VL08	60p

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	6886971	IT05
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	PU 51380	IT07
	PU 51402A	IT08
	PU 55373	IT09
	PU 55374	IT10
NATIONAL PANASONIC	VXP 0329	IT11
	VXP 0343	IT12
	VXP 0344	IT13
	VXP 0401	IT14
	VXP 0433	IT15
	VXP 0463	IT16
	VXP 0521	IT17
	VXP 0581	IT18
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VIDEO SERVICE KITS

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FERGUSON & JVC
3V42/43
HRD455/HRD725

Contents	*Economy Kit Contents*
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Order Code: SK37 **£16.00**	**Order Code: SK38** **£9.00**

3V58/59/64/65
HRD170/180/210/230/300/320/370/400/430/530/700/750
HRS5000
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3V29/3V30
HR7200/7300/7350
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3V35/36.38/39/49
HRD110/111/120/225
Contents
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Order Code: SK04 **£5.00**

3V31/3V42
HR7600/7610/7650/7655

Contents	*Economy Kit Contents*
BELT SET. T/U REEL TABLE TYRE. PINCH ROLLER. REEL IDERL. T/U CLUTCH. T/U IDLER. TENSION BAND. VIDEO LAMP	BELT SET. T/U REEL TABLE TYRE. PINCH ROLLER. REEL IDLER TYRE. T/U IDERL TYRE. T/U CLUTCH
Order Code: SK33 **£11.00**	**Order Code: SK34** **£5.00**

3V35/36/38/39/49
HRD110/111/120/121/225

Contents	*Economy Kit Contents*
BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. T/U CLUTCH. T/U IDLER. REEL IDLER. TENSION BAND	BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. T/U CLUTCH. T/U IDLER TYRE. REEL IDLER TYRE
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3V29/3V30
HR7200/7300/7350

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3V44/45/48/53/54/55/57
HRP50/HRD140/150/158/160
HRD250/257/565/566/755

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FVHP615/618/620/622/710/711/715/716/720/721/722/725/730/830/840

Contents	*Economy Kit Contents*
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Order Code: SK68 **£11.00**	**Order Code: SK69** **£3.00**

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VT11/VT33
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VIDEO SERVICE KITS *(Cont.)*

VT11/VT33

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Order Code: SK45 **£13.00**	**Order Code: SK46** **£3.75**

VT52/61/62/63/64/65/85/86/640

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. FF/REW ARM. CLUTCH PLATE. TENSION BAND	BELT SET. PINCH ROLLER. FF/REW IDLER
Order Code: SK49 **£14.00**	**Order Code: SK50** **£3.00**

VT400/405/410/13/14/15/18/420/25/26/28/430/31/35/48/450/498/510/520/25/26/530/35/36/540/545/46/48/570/75/576/580/85/88
Contents
TIMING BELT. PINCH ROLLER. FF/REW ARM. CLUTCH BASE. TENSION BAND
Order Code: SK52 **£9.75**

VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/VTL30
Contents
BELT SET. PINCH ROLLER. FF/REW ARM. CLUTCH PLATE TENSION BAND
Order Code: SK51 **£14.00**

PANASONIC
NV2000/NV2010

Contents	
BELT SET. PINCH ROLLER TENSION BAND. IDLER TYRES	
Order Code: SK03 **£5.00**	

NV7000/NV7200/NV7800

Contents	
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES	
Order Code: SK02 **£5.00**	

NV300/NV330/NV333/NV340/NV366
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRE
Order Code: SK01 **£5.00**

NV2000/NV2010

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. FF IDLER. PLAY IDLER. TENSION BAND. VIDEO LAMP	BELT SET. PINCH ROLLER. IDLER TYRE. PULLEY TYRE
Order Code: SK13 **£6.00**	**Order Code: SK14** **£3.50**

NV7000/NV7200/NV7800

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. IDLER UNIT. PLAY IDLER. TENSION BAND	BELT SET. PINCH ROLLER. IDLER TYRE. CLUTCH TYRE
Order Code: SK11 **£8.50**	**Order Code: SK12** **£3.25**

NV300/NV330/NV333/NV340/NV366

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. IDLER UNIT. PLAY IDLER. TENSION BAND	BELT SET. PINCH ROLLER. IDLER TYRE. PLAY IDLER TYRE
Order Code: SK15 **£7.00**	**Order Code: SK16** **£3.25**

NVG7/NVG9/VNG10/NVG11/NVG12/NVG14/NVG15/NVG16/NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (PX/AC)/AG1810 (P/K)

Contents	*Economy Kit Contents*
LOADING BELT. CAPSTAN BELT. PINCH ROLLER. IDLER TENSION BAND	LOADING BELT. CAPSTAN BELT. PINCH ROLLER. IDLER TYRE
Order Code: SK27 **£6.00**	**Order Code: SK28** **£3.00**

NV332

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. PLAY IDLER. FF/REW IDLER. TENSION BAND. FF/REW TYRE	BELT SET. PINCH ROLLER. PLAY IDLER TYRE. FF/REW IDLER TYRE
Order Code: SK29 **£12.00**	**Order Code: SK30** **£5.10**

NV230/250/260/280/430/450/460/470/650/810/890/AG1200PK/AG1500PK

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. IDLER. TENSION BAND	BELT SET. PINCH ROLLER. IDLER TYRE
Order Code: SK23 **£6.00**	**Order Code: SK24** **£3.25**

NV600/NV688

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. PLAY IDLER. FF/REW IDLER. TENSION BAND	BELT SET. PINCH ROLLER. PLAY IDLER TYRE. FF/REW IDLER TYRE
Order Code: SK25 **£12.00**	**Order Code: SK26** **£6.00**

NV730/NV770

Contents	*Economy Kit Contents*
SLOT IN BELT. LOADING BELT. PINCH ROLLER. IDLER UNIT. TENSION BAND	SLOT IN BELT. LOADING BELT. PINCH ROLLER. IDLER TYRE
Order Code: SK19 **£5.00**	**Order Code: SK20** **£3.00**

NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. IDLER. TENSION BAND	BELT SET. PINCH ROLLER. IDLER TYRE
Order Code: SK21 **£5.00**	**Order Code: SK22** **£2.75**

NV777/NV788

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. IDLER UNIT. TENSION BAND	BELT SET. PINCH ROLLER. IDLER TYRE
Order Code: SK17 **£6.00**	**Order Code: SK18** **£4.00**

VIDEO SERVICE KITS *(Cont.)*

SHARP
VC381

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. REEL IDLER. TENSION BAND. VIDEO LAMP	BELT SET. PINCH ROLLER. REEL IDLER TYRE
Order Code: SK47 **£8.00**	**Order Code: SK48** **£3.25**

VC500/VC571/VC581/VC582/VC583/VC584/VC5F3

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. REEL IDLER. TENSION BAND	BELT SET. PINCH ROLLER. REEL IDLER
Order Code: SK60 **£9.50**	**Order Code: SK61** **£5.00**

VC781/VC7810/VC7822/VC785/VC786/VC793/VC800/VCA100/VCA102/VCA104/VCA202

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. REEL DRIVE UNIT. TENSION BAND	BELT SET. PINCH ROLLER. REEL DRIVE UNIT TYRE
Order Code: SK64 **£13.50**	**Order Code: SK65** **£3.75**

VC681/VC682/VC684/VC685/VC693/VC699/VC6F3/VC700

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. REEL DRIVE UNIT. TENSION BAND	BELT SET. PINCH ROLLER REEL DRIVE UNIT TYRE
Order Code: SK62 **£13.50**	**Order Code: SK63** **£5.00**

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BACKUP BATTERIES

REPLACEMENT PHILIPS NI-CAD BACKUP BATTERIES
Replaces Ferguson Part No:
00E6-067-001, used on TX10, L2V — £9.00
Replaces Philips Part No's:
138-10138, 138-10313. 1.2V – 90mAh — 75p
Replaces Philips Part No's:
138-10229. 2.4V – 90mAh — £1.35

REPLACEMENT FERGUSON NI-CAD BACKUP BATTERIES
Replaces Ferguson Part Nos:
00E6-066-001, 2.4V
Used on: 3V35, 3V56, 3V58, 3V65 — 150p

REPLACEMENT LINE OUTPUT TRANSFORMERS

Description	Price	Order Code
HITACHI 2433752	1500p	LOT01
ORION 3714002	1500p	LOT02
FIDELITY ZX300	1500p	LOT03
FE TX100 90 DEG	1500p	LOT04
SABA 490007182	1500p	LOT05
FE TX90 WHITE	1650p	LOT06
ITT D307/37 EQ	1600p	LOT07
BLAUPUNKT 210	1600p	LOT08
GRUNDIG 2922010	1600p	LOT09
ITT CVC800/1/3	1500p	LOT10
ITTD218/37 EQ	1600p	LOT11
NORMENDE 5255	1600p	LOT12
SABA 81000 200	1600p	LOT13
SALORA T236 EQ	1650p	LOT14
SABA 811-50-24	1600p	LOT15
SABA 770223500	1600p	LOT16
TELEFUNKEN AT1	1450p	LOT17
TELEFUNKEN EQ	1400p	LOT18
SALORA FM0218B	1600p	LOT19
NORMENDE 5255	1600p	LOT20
ITT CVC 1150/1	1500p	LOT21
ITT COMPACT 80	1500p	LOT22
FE TX100 GREEN	1450p	LOT23
HINARI CT4/5 5113	1500p	LOT24
SELECO 6320410	1600p	LOT25
BLAUPUNKT 8667	1600p	LOT26
ITT COMPACT B1	1450p	LOT27
ITT CT3326 MUL	1500p	LOT28
ITT D066/37 EQ	1600p	LOT29
ITT 3546 EQ	1500p	LOT30
LUXOR 5810110	1600p	LOT31
SABA 849380920	1600p	LOT32
HITACHI 2434141 CP	1450p	LOT33
FE TX100 110 D	1700p	LOT34
HANTAREX 28021	1600p	LOT35
SHARP C3700 EQ	1600p	LOT36
HITACHI 2432981 CP	1500p	LOT37
FERGUSON 00D3-508-002 Fits Chassis TX99 41cm + 51cm Used On: 51K2, 51J8, 51J7, 41H3, 41H3, 41H2, 51K3	1650p	LOT38
PANASONIC TLF14567F Used On: TC2043, TC2243, TX300	1850p	LOT39
PANASONIC TLF14568F Used On: TX2231, TX2244	£15.00	LOT40
PANASONIC TLF14584F Used On: TC2210, TC2160, TX1752, TX2112 TX2112, TX2162, TXC22	2350p	LOT41
PANASONIC TLF14586F TC1651, TC2051, TC2061, TC2253, TC2263, TX5500	£18.00	LOT42
HINARI Used On: CT15	1600p	LOT43
HITCHI 2434274 CPT2174, CPT2176, CPT2178, 2434274	1250p	LOT44

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IDLERS & PULLEYS REPLACEMENT

AKAI

VS1-2, VS4-5, VS15	FF-REW IDLER	M1327773	400p
VS3, 6, 12, 56, 58, 59			
VS1-2, VS4-5, VS15	T-UP IDLER	BV327815	500p
VS3, 6, 12, 59, 59			
V9700	IDLER	BV321979	600p
VS125, 126, 155,	IDLER ASSY	MZ366960J2	900p
VS165, 240, 244, 245, 247, 248, 250, 512, 515, 516			
VS22, 38, 105, 112, 115, 116, 205, 220			
VP7100, VS9300	T-UP IDLER	PU47752	£4.50
VS9500, VS9800			
VP7100, VS9300	UNLOADING	PU46381	£4.00
VS9500, VS9800	IDLER		
VP7100, VS9300	REW IDLER	PU46380	500p
VS9500, VS9800			
VP88	IDLER	BV336067	£5.00
VS1, 3, 4, 9, 12	REEL TABLE	BR347731	450p
VS15, 58			
VS23, 35, 37, 53, 55	CLUTCH	ML373043	1100p
VS66, 75, VSA77			
VS9700	FF IDLER	BV321761	£3.20
VS9700	REW IDLER	W321762	£4.25

AMSTRAD

VCR7000	IDLER	150280	£1.50
TVR1, VCR4500	CLUTCH	150873	£3.75
VCR4600, VC5200, VCR9000			
TVR1, VCR4500	GEAR HOLDER	151284	£3.50
VCR4600, VCR5200, VCR9000			
TVR1, VCR4600	REF CLUTCH		£3.50
VCR5200			
VCR6000, VCR6100	CLUTCH	153202	£3.80
VCR4500, VCR9000	CLUTCH		£4.00
VCR4500, VCR4600	MOD KIT	(TAPE CREASING)	300p
VCR4700			
MOD KIT TAPE CREASING FOR AMSTRAD			
VCR4500, 4600, 4700			£3.00

FERGUSON

3V00, 3V01, 3V16	T-UP IDLER	PU47752	£4.50
3V22, 3292, 8900, 8901, 8904, 9806			
3V16, 3V22	T-UP IDLER	PU49280	£5.50
8903, 8909, 8912, 8922			
3V23, 3V29 3V30,	REEL IDLER	PU48967	175p
3V31, 3V32, 3V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942			
3V23, 3V31	ROLLER ASSY	PU49042A	350p
3V29, 3V30, 3V31	T-UP IDLER	51402	100p
3V32, 3V35, 3V36, 3V38, 3V39, 3V49, 8930, 8931, 8940, 8941, 8942			
3V29, 3V30, 3V31	T-UP CLUTCH	PU51380	200p
3V32, 8930, 8931, 8940, 8941, 8942			
3V35, 3V36, 3V38	REEL IDLER	PU55374	200p
3V39, 3V49, 8943, 8944			
3V35, 3V36, 3V38	T-UP CLUTCH	PU55373	150p
3V39, 3V49, 8943, 8944			
3V58, 3V59, 3V64	IDLER ARM	PU58645	£2.25
3V65, FV10, FV11, FV12 FV13, FV14, FV20, FV21, FV22, FV26			
FV30, FV32, FV33, 8950, VC141L			
3V42, 3V43	CLUTCH ASSY	PU55822	1200p
3V43, 3V44, 3V45	CLUTCH ASSY	PU57658	1050p
3V48, 3V53, 3V54, 3V55, 3V57, 8947, 8948			
3V42, 3V43, 3V44	T-UP CLUTCH	PU56043-1-4	240p
3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948			
3V42, 3V43, 3V44	SUPPORT CLUTCH	PU56044-1-5	160p
3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948			
3V00, 3V01, 3V16	LOADING IDLER	PU43681	£4.00
3V22, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909			
8912, 8922			
3V00, 3V01, 3V16	REW IDLER	PU46380	500p
3292, 8900, 8901, 8904, 8906			
3V16, 3V22, 8902	IDLER	PU49281	£1.70
8909, 8912, 8922			

FISHER

FVHP420, 520, 530	FF-REW PULLEY	HI638531	80p
FVHP615, 618, 620	COMP. IDLER ASSY	FI1430420400300	£220p
FVHP622, 710, 711, FVHP720, 721, 722, FVHP725, 730, 830			
FVHP840,905, 906, FVHP908, 910, 911, FVHP915, 916, 918			
FVHP615, 618, 620	GEAR IDLER ASSY	FI1430490400900	380p
FVHP622, 710, 711, FVHP720, 721, 722			
FVHP725, 730, 830, FVHP840			
FVHP615, 618, 620	REEL T-UP ASSY	FI1430410400900	£5.50
FVHP662, 710, 711, FVHP720, 721, 722			
FVHP725, 730, 830, FVHP840			
FVHP905, 906, 908,	GEAR IDLER ASSY	FI1430490402400	275p
FVHP910, 911, 915, FVHP916, 918			
FVHP975, 980, 990,	IDLER	FI1430420400700	300p
FVHP988, 5000, 5005			
FVHP5050, 5075, 5100			
FVHD40, 55, 140	REEL DRIVE ROLLER		£6.00
FVHP1, 10, 20			
FVHP975, 980, 990	CLUTCH	FI2430510404200	£9.50
FVHP420, 520, 530	IDLER		£2.80
FVHP420, 520, 530	TAKE UP IDLER		290p
FVHP980	LOADING GEAR		90p
VBS3500	REEL DRIVE PULLEY		£3.20
VBS3500	IDLER		250p
VBS7000	REW IDLER		95p

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GHV1221, 1232, 1240	CLUTCH GEAR	435038A	£2.50
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000,			
GHV8200, 8210, 8215, GHVP51, VCP4100, 4130			
GHV1221, 1232, 1240	IDLER		110p
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000,			
GHV8200, 8210, 8215, GHVP51, VCP4100, 4130			

HINARI

VXL3, VXL20	REEL IDLER	[illegible]	110p
VXL2	IDLER		110p
VXL4, VXL35	IDLER		£2.75
VXL4, VXL35	CLUTCH		£6.50
VXL4, VXL12, VXL25	LIMITER POST		£1.30
VXL30, VXL35, VTV300			
VXL5, VXL6	CLUTCH		£3.75
VXL5, VXL6	GEAR HOLDER		£3.50
VXL7, VXL8, VXL9	CLUTCH		£3.80

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VT11-33, VT63-64	CLUTCH ASSY	6879515	£7.50
VT14, 17, 19, 38, 57, 86, 88, 34, 35, 39, 52, 61			
62, 85, 85, 330, 640, VT16S			
VT120-220, 100, 110	CLUTCH ASSY	[illegible]	£7.50
111, 113, 115, 118, 200		[illegible]	
125, 128, 130, 135, 138, 145, 150, 175, 225, 250,			
255, 258, 260, VTL30			
VT8000-8300, 7000	FF-REW IDLER	[illegible]	£2.80
VT8500-8700			
VT8000-8300, 7000	PLAY IDLER	6414221	290p
VT8500-8700			
VT8000-8300, 7000	FF-REW PULLEY	6383531	80p
VT8500-8700			
VT9300-9500, 6500	FF-REW IDLER	8681471	250p
VT680, 6800, 9700, 9900			
VT9300-9500, 6500	PLAY IDLER	6861482	230p
VT680, 6800, 9700		6861481	
VT 9900			
VT9300-9500, 9700	IDLER	681505	230p
VT9900, 6500, 680, 6800	IDLER	687043	£3.80
VT11-33, VT63-64	FF-REW IDLER	6886971	125p
VT14, 16S, 17, 19, 34, VT35, 38, 39, 52, 61, 62			
VT65, 85, 86, 88, 330, 640			
VT1000, 110, 111, 113	FF-REW ARM	[illegible]	240p
VT115, 118, 119, 120, 125, 128, 130, 135, 138, 145, 150			
VT175, 220, 225, 250, 255, 258, 260, VTL30			
VT400, 405, 410, 413	FF-REW ARM	6897094	£1.30
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435			
VT438, 450, 498, 510, 518, 520, 525, 526, 530, 535			
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585			
VT588, VTM625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85			
VT400, 405, 410, 413	CLUTCH BASE	6896951	£5.00
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435			
VT438, 450, 498, 510, 518, 520, 525, 526, 530, 535			
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585			
VT588, VTM625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85			
VT3000	T-UP IDLER (LARGE)		£4.50
VT3000	REW IDLER		£6.00
VT680, 6500, 6800	FS-BRAKE	6861505	230p
VT9700, 9900			

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OUTPUT MODULE HM 6232		£8

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HR330, 3660, 4100	T-UP IDLER SML	PU49280	£5.50
HR7200, 7600, 7650	T-UP CLUTCH	PU53462A	220p
HR7655, 7300, 7350, 7610			
HR7200, 7300, 7350	REEL IDLER	PU48967	175p
HR7600, 7610, 7650, 7655, 7700			
HR7600, 7610, 7650	ROLLER ASSY	PU49042A	350p
HR7655, 7700			
HR3300, 3660, 4100	T-UP IDLER LRG	PU47752	£4.50
HR7200, 7600, 7650	T-UP IDLER	PU51402A	100p
HR7655, HRD110, HRD111, HR7300, 7350, 7610, HRD120-121, 225			
HRD110, HRD120-121,	T-UP CLUTCH	PU55373	150p
HRD225, HRD111,			
HRD110, HRD120-121,	IDLER ARM	PU55374-3-8	200p
HRD225, HRD111			
HRD170, 180, 210, 230	IDLER ARM	PU58465	£2.25
HRD320, 370, 400, 430, 470, 530, 700, 750, 950, 3000			
HRS5000, HRS5500			
HRD455, HRD725	CLUTCH MECH	PU558822	1200p
HRD140, 150, 157, 158	CLUTCH MECH	PU57658	1050p
HRD160, 250, 257, 565, 566, 755, HRP50			
HR3300, HR3330	REW IDLER	PU46380	500p
HR3660, HR4100			
HRD140, 150, 157, 158	TAKE UP CLUTCH	PU56043-1-4	240p
HRD160, 250, 257, 455, 565, 566, 725, 755, HRP50			
HRD140, 150, 157, 158	TAKE UP CLUTCH	PU56044-1-5	160p
HRD160, 250, 257, 455, 565, 566, 725, 755, HPR50			

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VX730, 735, 750, 755,	CLUTCH	850A00005	420p
VX810, 820, 850, 880, 990			
VX730, 735, 750, 755	LIMITED POST LEVER		£1.30
VX770, 800, 810, 880	ASSY		
VX990			
VX800A, VX900	IDLER REEL		£1.50
VX800A, VX820	REEL UNIT CLUTCH		280p

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HS306, 307, 318, 319,	GEAR ASSY	522B00201	£6.25
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HS337, 338, 347, 349	IDLER	552B01701	325p
HS411, 412, 421, HSB10, HSB20, HSB30, HSE10, HSE20, HSE30, HSE30,			
HSE70			
HS306, 307, 318, 319	IDLER	641C34301	£2.00
HS400, 410, 710			
HS347, 349, 412	IDLER	522902002	£3.00
HSB10, HSB20, HSB30, HSE10, HSE20, HSE30, HSE70			
HS337, 338, 411, 421	IDLER	552B01801	320p
HS200	TAKE UP IDLER (LARGE)		£4.50
HS200	UNLOADING IDLER		£4.00
HS200	REWIND IDLER		£5.00
HS306, 307, 318, 319	SUPPLY REEL	522A00101	£3.20
HS400, 410, 710	DISK		
HS306, 307, 318, 319	TAKE UP REEL	522A00102	£3.20
HS400, 410, 710	DISK		
HS320	REEL DISK	522C06301	£3.00
HS337, 338, 411, 421	REEL DISK	522P00601	£5.00
HS300, 301, 302, 310	PULLEY	522C05201	£2.25
HS306, 307, 318, 319	GEAR WHEEL	641D71101	£1.50
HS400, 410, 710			
HS306, 307, 318, 319	GEAR WHEEL	641D71001	£1.50
HS400, 410, 710			

NEC

N830, N831, N832, N833	TAKE UP CLUTCH	150p
N830, N831, N832, N833	TAKE UP IDLER	100p
N830, N831, N832, N833	REEL IDLER	200p
N895	TAKE UP IDLER SMALL	550p
N911, N915, N916, N917	REEL DRIVE PULLEY	350p
N9012, 9013, 9014, 9016, 9033, 9034, 9054, 9055, 9066, 9110		
N9510, 9520, 9530, 9610		

NATIONAL

NV322, NV600, NV688,	IDLER UNIT	VXP0463	£2.75
NV777, NV788, NV332, AG6100, 6200, 6800, 6810			
NV300, NV333, NV340	IDLER ARM	VXL0997	£3.60
NV366			
NV300, NV330, NV333	IDLER UNIT	VXP0401	60p
NV340, NV366			
NV300, NV330, NV333	PLAY IDLER	VXP0433	£2.75
NV340, NV366, NV8620			
NV300, NV332, NV333	ACTION GEAR	VDG0016	£0.60
NV340, NV366, NV600, NV777, NV788, NV2000, NV2010, 3000, 7000			
AG6010, AG6015			
NV333, NV688, NV2000	LOADING GEAR	VXP0325	£2.00
NV3000, NV7800			
NV300, NV332, NV333	INTERMEDIATE GEAR	VXG0017	£0.65
NV340, NV366, NV600, NV777, NV788, NV2000, NV2010, 3000, 7000			
AG6010, AG6015			
NV330, NV333, NV340	CAM GEAR	VXG0158	£1.00
NV366, NV777, NV788			
NV230, NV250, NV260	IDLER ARM	VXP0521	110p
NV280, NV370, NV380, NV430, NV450, NV460, NV465, NV470, NV480			
NV630, NV650, NV730, NV780, NV810, NV830, NV850, NV870			
NVG7, NVG9, NVG10, NVG11, NVG12, NVG 14, NVG15, NVG16, VG18			
NVG30, NVG400, AG1000, AG1200, 1500, 1810, 2100,			
AG2200, NVH65, NVH70			
NV370, NV430, NV870,	CAM GEAR	VDG0200	£1.20
NV730, NV830, NV850, NVG10, NVG12, NVG18			
NV730, NV770	IDLER UNIT	VXP0581	£2.50
NV2000, 2010 3000	IDLER UNIT	VXP0331	80p
NV2000, 2010, 3000	IDLER UNIT	VXP0329	80p
NV2000, NV3000	CAM GEAR	VDG0069	£1.00
NV7000, 7200, 7800	IDLER UNIT	VXP0344	75p
NV7000, 7200, 7800	CLUTCH	VXP0343	300p
NV8150, 8200, 8300,	IDLER UNIT	VXP0245	80p
NV8400, 8600, 8610, 8620			
NV8200, 8400, 8600	PLAY IDLER	VXP0243	80p
NV8610, 8620			
NV8620	CLUTCH	VXP0343	250p
NV332, NV600, NV688	IDLER	VXPO488	300p
NVG20, NVG21, NGV25	PULLEY UNIT	VXP0767	400p
NVG40, NVG45			
NV230, NV250, NV280	WORM WHEEL	VXP0604	160p
NV430, NV450, NV460, NV465, NV650, NV730, NV770, NV810			
NV870, NV890, AG1000			
NV370, NV380, NV630	IDLER	VXP0523	300p
NV780, NV830			
NV370	CLUTCH GEAR	VXP0595	£1.00
NVG7, NVG11, NVG12	WORM WHEEL	VXP0691	£1.50
NVG14, NVG15, NVG18, NVG30, NVG120, NVG130, NVG400, NVH70			
NV2000, 2010, 3000	LOADING GEAR	VDG0035	£0.60
NV7000, 7200, 7800, 8050			
NV230, NV250, NV370	LOADING GEAR	VXP0520	£1.50
NV430, NV450, NV460, NV630, NV730, NV770, NV780, NV810			
NV830, NV890, NVG7, NVG10, NVG12, NVG15, NVG30, NVG120			
NGV130, NVG400, NVH70, AG1000			
NV230, NV250, NV260	CLUTCH GEAR		£2.50
NV280, NV430, NV450, NV730, NV770, NV810, NV870, NV890			
NVG7, NVG10, NVG11, NVG12, NVG14, NVG15, NVG18, NVG30			
NCG120, NVG130, NVG400, NVH70, AG1000			
NV230, NV250, NV260	LIMITER ROLLER		£1.50
NV280, NV300, NV333, NV340, NV366, NV370, NV430, NV450, NV460			
NV465, NV630, NV650, NV777, NV780, NV788, NV810, NV830, NV850,			
NV870, NV890, NV2000, NV2010, 7200, 7800, NVG7, NVG10, NVG12,			
NVG14, NVG15, NVG18, NVG30, NVG120, NVG130, NVG400, NVH70,			
AG1000			

SANSUI

VR605, VR800, VR900	CLUTCH	850A20000	420p
VR1100, 1200, 1600, 2500, 3200, 3300			
VR3500, 3600, 3800	LIMITER POST		£1.30
VR1100, 1200, 1600, 2500, 3200, 3300, 3500, 3600, 3700			
VR605, VR800, VR900	IDLER		280p
VR2500, 3200, 3300, 3500, 3600, 3800			
VR705, VR805, VR905	IDLER		110p

SANYO

VHR1110, 1150, 1200	IDLER	143-0-662T-14730	£5.00
VHR1300, 1500			
VTC5000, 5150, 6000	FF-REW IDLER	143-0-741T-20001	250p
VTC6500, VTCM10, M11, M20, M21, M30, M31, M50			
VTC9100, VTC9300	IDLER	143-0-551T-01400	95p
VTC9300	FF ROLLER ASSY	143-0-547T-00200	200p
VTCM10, M11, M20, M21	REEL DRIVE PULLEY	143-0-662T-10350	£5.00
VTCM30, M31, M50			
VHR2100, 2300, 2500	IDLER	6130374899	300p
VHR2700			
VTC5000, 5150, 6000	PULLEY	143-0-662T-01201	£5.20
VTC6500			
VTCM10, M11, M20, M21	PULLEY	143-0-662T-10350	£5.50
VTCM30, M31, M50			
VHR3100, 3300, 3310	REEL DRIVE	143-0-662T-15621	350p
VHR3400, 3700, 3800	ROLLER		
VHRD500, VHRD700			
VPR5800, VTC5300	LOADING ROLLER	143-0-661T-03800	80p
VTC5400			
VTC3000	FWD LIMITER		£3.50
VTC3000	IDLER		750p

SHARP

	IDLER ASSY	NIDL0005GEZZ	110p
	IDLER	NIDL0006GEZZ	110p
VC600, 651, 681, 682	IDLER ASSY	NPLYV0107GEZZ	£6.15
VC684, 685, 693, 699, 700, 783, VC6FR, VC6V3			
VC7300, VC7700, 7750	PLAY IDLER KIT	NPLYV0041+ NDA1V1007	£7.50

FAULT FINDING GUIDE BOOKS

Satellite Fault Finding Guide Issue 1. Listing about 1,000 faults for over a range of 24 different brands. Order Code: BOOK05.
Price £8.50 – No VAT.

Video Recorders Edition 4
List more than 4500 faults for 43 different brands
Price £12.75p Only. No VAT. Order Code: BOOK01

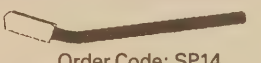
TELEVISION Edition 5
Lists more than 6,000 faults with 306 pages covering 58 different brands
Price: 1450p only - no VAT. Order Code: BOOK02

Satellite Repair Manual Edition 3

A comprehensive guide to receiver reviewing, featuring stock faults and installation tips.
Price 1400p Only No VAT Postage 100p
Order Code: BOOK03

SEMICONDUCTOR COMPARISONS 1996
Listing more than 29,000 Semiconductors with suitable alternative complete with descriptions and base information.
Price: £14.50 – No VAT. Order Code: BOOK04

VIDEO HEAD CLEANING STICKS



Order Code: SP14
Price 17p each 15P each pack of 10pcs
13P each pack of 25pcs

VIDEO MAINTENANCE TOOLS
Set of 8 Allen keys packed in a plastic wallet
Order Code: TOOL9
Price 125p
Specifically designed for video maintenance

Solder Mop 1.2mm×10metres	**400P**
Tubed Silicon Grease 50 gram	**200P**
Tubed Heat Sink Compound 25 gram	**150P**

UNIVERSAL HEAD EXTRACTOR TOOL

Hand tool designed for extracting hard to remove heads without damage to either the head or the mounting assembly. Adjustable so as to suit various brand heads.
PRICE – £6.50

GRANDATA LTD
Tel: 0181-900 2329
Fax: 0181-903 6126

JUST ARRIVED!!! NEW ITEMS

Satellite PSU Repair Kits

Experience shows that 50% of all receiver power supplies 'bounce' unless the correct precautionary measures are taken when being serviced. A kit of all the recommended parts is supplied for the 4 most popular models, which when fitted should overcome this.

MAKE & MODEL	ORDER CODE	PRICE
PACE PRD800, PRD900	SATPSU1	650p
PACE SS9000, 9200, 9010, 9020, 9220	SATPSU2	650p
AMSTRAD SRD510, SRD520	SATPSU3	650p
AMSTRAD SRD500	SATPSU4	650p

Replacement Video Heads

MAKE	MODELS	PRICE
HITACHI	VT570, VT575, VT576, VT580, VT585 VT588, VTF70	3100p
I.T.T.	VR3761	3100p
JVC & FERGUSSON	HRD950, HRD960, HRD980, FV46	5000p
LUXOR	VR3761	3100p
MITSUBISHI	HSE51	3000p
NATIONAL PANASONIC	NVFS200, NVFS90, NVV8000	4600p
	NVHD100, NVHD101, NVHF100	3100p
	NVSD	1400p
	AG7330, AG7350, AG7355, AG7450	5000p
	NVFS100	5000p
N.E.C.	D5600	3500p
SANYO	TLS1000P, TLS1001P, TLS1100	3100p
	VHR7800, VHR7810, VHR8000SP, VHR8801SP, VHRD4800	3100p
SHARP	VCH80, VCH81, VFH815	2800p
	VCA33, VCA36, VCA43, VCA44, VCA46, VCA49	1500p
	VCA55, VCA63	2200p
SONY	SLV656, SLV715, SLV757, SLV777, SLV815, SLV825	4600p
	SLV353UB	3200p
	CCDF340E, CCDF500E, CCDV90E, CCDV95E, CCDSP5E	4800p

Original Video Heads

MAKE	MODELS	PRICE
NATIONAL PANASONIC	NVG20, NVG21, NVG22, NVG25 NVG25, NVG28, NVG200, NVD48 PART NO: VEH 0343	3000p
	NVG33, NVG45, NVG46, NVL23 NVL25, NVL28 PART NO: VEH 0417	2900p
	NVJ30, NVHJ33, NVL20, NVL21, NVG30, NVG31, NVG40, NVG130 PART NO: VEH 0416	2700p

Audio Control Head

AMSTRAD ORIGINAL NO: 150751
Used on: AMSTRAD TVR1, 2, 3, VCR4600, 4600MKII, 4700, FUNAI VS2, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000
Also fits: FIDELITY, FUNAI, HINARI, PROLINE, SCHNEIDER, TOWADA, UNIVERSUM **ORDER CODE: AH01 PRICE: 1350p**

AMSTRAD ORIGINAL NO: 153134
Used on: AMSTRAD DD8900, 8904, VCR2000, 6000, 6100, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244
Also fits: ANITECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLDHAND, GRANADA, HINARI, MARQUANT, OMEGE, PROFEX, SCHNEDIER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM **ORDER CODE: AH02 PRICE: 1450p**

Replacement Audio Control Video Sound Head for National Panasonic

PART NUMBER	MODELS	PRICE
VBR 0091	NVG7 etc	875p
VBR 0050	NV300, NV340 etc	875p
VBR 0061	NV777 etc	875p
VBR 0103A	NV250, NV450 etc	625p
VBR 0125		625p

8 way Preprogrammed Universal Remote Control

A single remote control to operate Televisions, Videos and Satellite Receivers. Plus Auxilliary Options!!
* Replaces up to 8 remotes with one * Simple 4 digit setup routine
* Controls 1000s of models * Teletext functions with Fastext
* Clear (large key) layout * Code Search Facility
* Stylish and easy to operate * Replace broken or lost remotes
* Original Remote not required

Order Code: 8 WAY Price 1450p + VAT

Replacement Video Cassette Housings

MAKE	MODELS	CODE	PRICE
AKAI	VS35, VS53, VS55, VS56, VS75	CH18	2600p
GRANADA	VHSDP1	CH05	1100p
	VHSYJ2	CH01	2800p
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1891P, 20001Q, 20051Q, VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316,4320, 4321, 4325	CH25	2000p
	GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV8000, 8200	CH26	2900p
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225	CH01	2800p
	3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD140, 141, 150, 157, 158, 160, 250, HRD257, 455, 565, 566, 725, 755	CH02	2800p
	8948, 8950, FV10B, 12L, 13H, 14T, 20B, 21R, 22L, 26, 395, HRD230, 430, 530	CH03	2600p
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370	CH04	2600p
	FV31R	CH19	4300p
	HRD515, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H	CH20	2400p
	HRD540, 580, 830, 860, 910, 960, HRD970, HRDX20, FERGUSON FV57H	CH27	2400p
I.T.T.	VR3605, VR3905	CH01	2800p
	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p
	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p
NATIONAL PANASONIC	NV730	CH06	4300p
N.E.C.	N830EG, N831EG, N832, N833EG	CH01	2800p
	N895	CH02	2800p
PHILIPS	CASSETTE LIFT ASSEMBLY (69120366) DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6293, 6362, 6367, 6393, 6467, 6468, 6470, VR6561, 6670, 6760, 6761, 6870, 6970	CH05	1100p
	VR6443	CH22	2900p
	VR6448	CH23	2500p
	49SB6	CH24	2500p
SHARP	VCA100, VCH851, VCH852	CH22	2900p
	VCA103, 103GV, 106, 106GVM, 254GVM	CH23	2500p
	VCS211, 244, 5055, 605, VCB230, VCD806G, 810G, VCT212, 310, 410G, 610	CH24	2500p
TELEFUNKEN	VR2970	CH02	2800p
THOMSON	V320, 321, 323, 326, 4200, 4300	CH01	2800p
	V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540	CH02	2800p
TOSHIBA	V55, V57	CH01	2800p
	V65, V66	CH02	2800p

Service Aids

DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	140p
SWITCH CLEANER	176ML	SP02	150p
SILICONE GREASE	200ML	SP03	170p
FREEZE IT	170ML	SP04	220p
FREEZE IT	400ML	SP16	550p
FOAM CLEANER	400ML	SP05	170p
ANTI STATIC	150ML	SP06	170p
AEROKLEANE	135ML	SP07	200p
AERO DUSTER	150ML	SP08	220p
AERO DUSTER	400ML	SP17	550p
PLASTIC SEAL	200ML	SP09	200p
GLASS CLEANER	250ML	SP10	160p
COLDKLENE	250ML	SP13	200p
EXCEL POLISH 80	250ML	SP18	150p
ADHESIVE 120	400ML	SP19	190p
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SP11	200p
TUBE SILICON SEALANT WHITE	75ML	SP22	280p
TUBE SILICON SEALANT CLEAR	75ML	SP23	280p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
DRIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	150p
COMPUTER CARE KIT	—	SP26	2100p

All the above items are manufactured by Servisol

If you purchase more than one Servisol Product, postage & package will be charged as follows:
300p for 5 cans **450p** for more than 5 cans

CD Pick Ups

SONY OPTICAL PICK UP
PART NO: KSS210A SONY CDPC 301M, CDPC 305M **2200p**
Fits most Sony, Akai & J.V.C. Portable Hi-Fi and Midi Systems

PART NO: KSS210B
USED ON MODELS:
CFD100, 105L, 120, 300, 440, 454, 455, 50, 500, 55, 58, 60
CFD68, 750, 755, 760, 765, 770, 775, 440S, W100, 100S **2200p**

Cassette DC Motors

MOTOR TYPE	PRICE
6V MOTOR	170p
9V MOTOR	170p
12V CW MOTOR	170p
12V CCW MOTOR	170p
13.2 CCW MOTOR	290p

Cassette Tape Heads

HEAD TYPE	PRICE
MONO HEAD	90p
STEREO-HEAD	110p
MINI HEAD	150p
AUTO REVERSE HEAD	200p

Soldering Accessories

DESCRIPTION	CODE	PRICE
ANTEX SOLDERING IRONS		
25 WATT 240 VAC (XS25W 240V)	S101	900p
15 WATT 240 VAC (XS15W 240V)	S102	900p
25 WATT SPARE ELEMENT	S103	450p
15 WATT SPARE ELEMENT	S104	450p
SOLDERING STAND & SPONGES		
SOLDERING STAND (MADE BY ANTEX)	S108	350p
SPARE SPONGE	S109	55p
SOLDER		
18 SWG 500 GRAMMES	S110	500p
20 SWG 500 GRAMMES	S111	650p
22 SWG 500 GRAMMES	S112	700p
DESOLDERING AIDS		
SOLDER MOP STANDARD GAUGE 1.2mm x 1.5M	S107	80p
SOLDER MOP 1.2mm x 10M	S113	400p
DESOLDERING PUMP	S105	320p
SPARE NOZZLE	S106	60p

Transistors & ICS

BU 508A (PHIL)	80p	MJE 13009	100p	2SC 3885A	350p
BU 810	110p	MJE 18004	125p	2SD 633	70p
BUZ 90A	180p	STK 6982H	600p	2SD 1680	225p
CXA 1044P	550p	STK 7253	450p	2SK 793	400p
HA 13408	350p	TDA 2030H	100p	2SK 956	1400p
IRFBC40	400p	TEA 2019	200p	2SK 1023	550p
L272	200p	TMP 47C434N	1250p	2SK 1342	750p
L6210	250p	SAA 1300	200p	2SK 1358	600p
MC 3423P	100p	2SA 1540	55p	68000	500p
MJ 15015	250p	2SC 3788	60p	82S147	450p
MJ 15016	350p	2SC 3885	350p		

GRANDATA LTD
Tel: 0181-900 2329
Fax: 0181-903 6126

REMOTE CONTROLS

Description	Order Code	Price
GRUNDIG		
TP160E	RC 107	900p
TP200, TP300	RC 380	800p
TP400	RC 401	675p
TP590-600	RC 600	850p
TP390,TP610	RC 610	850p
TP621	RC 621	850p
TP630, TP650	RC 650	850p
TP660	RC 660	850p
TP661	RC 661	850p
HITACHI		
CLE800-CLE830	RC 140M	700p
A617402/655602	RC 192	875p
A512120/230	RC 900	800p
A514790	RC 901	800p
A5088470	RC 902	800p
A518612	RC903	900p
SCL002	RC904	850p
C2096	RC 905	850p
A511940	RC 906	750p
655602H	RC 907	800p
ITT		
IFB13, 14, 15	RC 143	875p
FS4	RC 148	850p
RG305	RC 305	675p
RG306	RC 306	825p
FS9/1-10/1	RC 307	850p
VS5 RUK	RC 308	825p
VS4-1	RC 310	850p
MULTICONTROL (17C20)	RC 311	800p
KORTING		
18279, 18396, 18460, 18521 SE	RC 108	850p
40540 VTS	RC 108	900p
LOEWE		
DC11	RC 146	850p
MATSUI		
010270601	RC 889	850p
VX770	RC 892	850p
METZ		
JAVA COLOR (6890)	RC 166	850p
COLOR (7156)	RC 183	850p
JAVA (7180)	RC 184	850p
MITSUBISHI		
939P/03607, 939P/03609	RC 140M	850p
NOKIA		
SATELLITE	RC 550	850p
NORDMENDE		
TC2336	RC 351N	850p
CMC1, TC3519	RC 356	875p
OCEANIC		
390C9500	RC 339	900p
ORION		
RC53	RC 892	850p
PANASONIC		
EUR51200	RC 200	800p
TC2200	RC 201	850p
VSQ0357/NV730	RC 202	875p
TNQ1621	RC 203	900p
PHILCO		
CARVEL, CONCORDE, MERCURY, TELESTAR	RC 108	850p
TC10	RC 152	900p
PHILIPS		
RC5002,5154	RC 134	850p
KT3 NON TEXT	RC 135	825p
69117032	RC 178	875p
69117194	RC 180	875p
RC5991-UNIV	RC 300	580p

Description	Order Code	Price
PHILIPS (continued)		
RC38	RC 301	750p
KT3 TEXT	RC 5301	750p
RC5352	RC 5352	800p
RC5375	RC 5375	850p
RC5 STANDARD	RC 5534	850p
RC5901	RC 5901	850p
RC5903	RC 5903	700p
SABA		
T6772	RC 149	900p
TC319-320	RC 328	875p
TC356	RC 356	875p
TC358	RC 358	850p
TC360	RC 360	800p
TC365	RC 365	800p
SALORA		
SERIES L	RC 190	875p
86173	RC 882	850p
SANYO		
RC218, RC222, RC228, RC238	RC 140M	700p
JXGE	RC 878	850p
JXDE	RC 884	850p
VHR2300	RC 890	850p
RC628	RC 865	900p
SHARP		
G0121CESA, 123CESA, 204, 251	RC 140M	850p
SIEMENS		
FC616	RC 130	850p
FC631	RC 132	850p
FC742	RC 164	900p
SONY		
RM604, RM605, RM606	RC 140	700p
32 CHANNEL	RC 140M	700p
RM613	RC 141	750p
RM632, RM636	RC 160	675p
TATUNG		
FXA	RC 877	850p
RC70	RC 883	750p
FX70 FASTTEXT	RC 894	850p
TELEFUNKEN		
FB632	RC 632 ST	850p
FB639	RC 639 ST	850p
THORN/FERGUSON		
3V35-42	RC 342	650p
3V31-32	RC 344	800p
3V57-58	RC 628	800p
TX10 TEXT	RC 732	575p
TX10 STEREO TEXT	RC 738	575p
TX9-90-100	RC 740	675p
3V55, FV11	RC 783	800p
TX100 FASTTEXT	RC 785	650p
TX100 STEREO FASTTEXT	RC 789	650p
PROFESSIONAL	RC 790	650p
TOSHIBA		
CT937	RC 950	850p
CT9117	RC 951	800p
201R4B	RC 952	800p

UNIVERSAL PROGRAMMABLE REMOTE CONTROL

Controls up to 4 different devices which use infra red remote controls including TV, audio, VCR and satellite. (need original remote control TC program)

Order code: IR100R Price: 1950p

We stock Remote Controls for over 5000 different models. Ring for further details on 081-900-2329.

VCR ALIGNMENT KIT

CONTAINS:

SET OF 7 HEAD & TAPE PATH ALIGNERS

- RCA TYPE AUDIO & CONTROL HEAD POSITIONING TOOL
- RCA ADJUSTMENT TOOL FOR TAPE GUIDE POSTS
- RCA TYPE BACK TENSION TOOL
- TENSION ADJUSTMENT TOOL FOR VARIOUS USES
- VCR ADJUSTMENT TOOL

SET OF 8 ALLEN KEYS

- 0.77mm
- 0.90mm
- 1.27mm
- 1.50mm
- 1.60mm
- 2.00mm
- 2.40mm
- 3.00mm

3 Reversible Screwdrivers
Circlip Pliers
Spring Hook
Micro Screwdriver
VCR Head Extractor

Order Code: TOOL10 Price: 2900p

FUSES

	TIME LAG (20mm)		QUICK BLOW (20mm)	
Value	Order Code	Price	Order Code	Price
160mA	FUSE01	75P	FUSE17	60P
250mA	FUSE02	75P	FUSE18	60P
315mA	FUSE03	75P	FUSE19	60P
400mA	FUSE04	75P	FUSE20	60P
500mA	FUSE05	75P	FUSE21	60P
630mA	FUSE06	75P	FUSE22	60P
800mA	FUSE07	60P	FUSE23	60P
1A	FUSE08	60P	FUSE24	60P
1.25A	FUSE09	60P	FUSE25	60P
1.6A	FUSE10	60P	FUSE26	60P
2A	FUSE11	50P	FUSE27	60P
2.5A	FUSE12	50P	FUSE28	60P
3.15A	FUSE13	55P	FUSE29	50P
4A	FUSE14	55P	FUSE30	50P
5A	FUSE15	60P	FUSE31	50P
6.3A	FUSE16	60P	FUSE32	50P

FUSES

CURRENT RATING	ORDER CODE	PRICE
CERAMIC PLUG TOP		
3A	FUSE33	100P
5A	FUSE34	100P
13A	FUSE35	100P
20MM CERAMIC TIME LAG		
3.15A	FUSE41	100P
4A	FUSE42	100P
5A	FUSE43	100P
6.3A	FUSE38	100P
8A	FUSE39	100P
10A	FUSE40	100P
32MM CERAMIC SLOW BLOW		
8A	FUSE44	210P
10A	FUSE45	210P
15A	FUSE46	210P
20A	FUSE47	210P
38MM CERAMIC SLOW BLOW		
10A	FUSE48	875P

ALL THE ABOVE PRICES ARE FOR PACKS OF 10 FUSES

I.C. PROTECTOR

ICPF10	ICPF38	ICPN10	ICPN38
ICPF15	ICPF50	ICPN15	ICPN50
ICPF20	ICPF75	ICPN20	ICPN75
ICPF25	ICPN5	ICPN25	

Price: Only 30p each

AUDIO CONTROL HEAD

Amstrad Original No: 150751

Used on Amstrad TVR1.2.3, VCR4600, 4600MII, 4700 Funai V2S, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000 Also fits: Fidelity, Funai, Hinari, Proline, Schneider, Towada, Ultravox

Order Code: AH01 Price: £13.50

Amstrad Original No: 153154

Used on Amstrad 008900, 8904, VCR2000, 6000, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 9244

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Satellite WORKSHOP

Jack Armstrong

Having just attended the dealer training course on the MSS200 at Pace's factory in Shipley I should be an expert on it. I haven't had many in for repair however. Early problems seem to have been solved during the warranty period: the receivers I see are those that have suffered from contamination or a mains surge caused by lightning.

These surges seem to destroy the chopper transistor without doing much other damage. I recommend that you always replace the 47µF, 400V mains bridge rectifier's reservoir capacitor however – I've seen a few that have failed.

Pace's training courses really are excellent. In the past, other manufacturers have charged £99 and thrown in a buffet lunch. Pace do the course and provide a full works restaurant meal plus service manual with updates free of charge. As spaces are limited, the training is for dealers' staff only. So book early. I don't have a list of future courses, but details can be obtained from Tricia Payter on 01274 532 000.

Stereo Sound

Some questions come up time and time again. A favourite is "why, when I connect my satellite receiver to my Nicam stereo VCR via the RF cable, don't I get stereo sound?" The answer is to make the left and right audio connections via the scart or phono sockets, whichever are provided. Even then the VCR's Nicam light will not come on, because Nicam stereo is not available via satellite. Many films use Dolby Pro-Logic Surround sound however, and a suitable receiver and amplifier combination (or the MSS1000) will provide amazing sound effects.

E-mail Blues

I've answered quite a lot of e-mail enquiries since I first offered this service in the column. It takes time, but is interesting since it brings to my attention faults that others are experiencing and quite often I can help. The only real problem is that I have a shocking memory. If someone sends me a question one day then refers to my answer a couple of days later I can't remember the original question!

A typical e-mail follow-up might go along these lines: "Dear Jack, thank you very much for your reply. Now I have another problem. Can you tell me why it causes wavy lines on the other three channels? Kind regards. . . " When this first happened I spent a fruitless hour searching through previous replies to find the original question and answer. Now I don't bother. So if you get no reply, or a very curt "huh?", you know why!

I answer between five and twenty messages a day. They come from all over Europe, and are not just in English. It all takes time. If you want to tell me about new faults and solutions, I'm very interested to know about them. If you have a problem, I am only too pleased to help: but please list all relevant details and use a separate message for each model. If you list several models and faults in one message it becomes confusing. Please don't use abbreviations: I don't always understand them. E-mail is not like Telex or Morse Code. Type full words – it doesn't cost.

Those of you who don't have e-mail simply do not know what you are missing! It's rapidly taking over from fax. Costs are typically as follows. £10 per month plus VAT gets you an 'address' at a local computer 'point of presence' (POP). In addition to that you might spend (as I do) just five minutes each evening actually connected via the telephone modem. Five minutes is all it takes to download my new e-mail and send the replies I typed the day before. Unlike fax, the replies are sent in one batch to the local POP computer. This computer then sends each reply to the relevant address – at its leisure (usually within two hours). Meanwhile I've been connected to the telephone line for less than five minutes. That's about 10p per day. Total monthly cost, about £13 plus VAT.

The Cambridge RD480

A customer brought in one of these receivers with the complaint that some of the channels were missing. Suspecting a polarisation voltage problem, I checked this out on the bench but could find nothing amiss. So I gave it back to him. The following day he returned, complaining that he could receive only two programmes above a certain channel number. This was so – the receiver wouldn't tune higher than Sky Sports.

Closer inspection showed that the top of C172 (2,200µF, 35V) was bulging. The cause of this was not hard to find since the diodes that feed it also looked the worse for wear. In fact one of them was open-circuit.

For good measure I replaced all fourteen diodes in the power supply. As they are difficult to desolder without peeling tracks off the board, my usual approach is to snip the diodes flush with the top surface of the board then desolder the remaining leg sections from beneath.

For reference, the tuning voltage supply across C172 should be in excess of 32V.

I had another RD480 in during the same week with the same fault, though this time the symptom was

that the screen would suddenly go blank five minutes before the end of a film. After cooling down, the set would work fine until five minutes before the end of the next movie – or so the customer said! It looked like a tuner fault but wasn't.

An Amstrad SRD545

This model is based on the SRD510, with a few circuit design improvements. The one that was brought in showed "your card is invalid" when a valid card was inserted.

Fitting known good decoder and card reader boards failed to cure the fault, which I eventually found was caused by R205 (10Ω) being open-circuit. This resistor is not present in the SRD510 – it's one of the improvements for better reliability. Oh dear! You'll find it near the front left-hand corner of the main PCB.

Another problem I've been seeing with these 'improved reliability' receivers is failure of C622 (2,200µF, 10V) in the 5V supply. When it goes open-circuit the feedback regulation system raises all the secondary voltages. The result is usually a line of exploded electrolytics across the main board and the power supply. You can easily be fooled, because the only one that doesn't explode is C622 itself. Unfortunately the fault usually destroys the decoder module. If you have one of these receivers on the bench, monitor the LNB supply: the first sign of the fault condition is 60V going to the LNB which, believe me, smokes!

Manuals

I've received a copy of a service manual, produced by Grove Farm Publications, that covers the Grundig GRD100/150/200 /250/280/300, JVC TU-C200, Matsui RD600 and Philips STU3301/3501/3601 satellite receivers. It's excellent: comprehensive, with circuits, circuit descriptions and parts lists. Price is £14.95 plus £1 postage, from Grove Farm Publications, Grove Farm, Long Lane, Barnby In The Willows, Newark, Notts NG24 2SG.

The Discus Ellipse receiver forms the basis of a budget motorised system. There are plenty of them in use and they are generally quite reliable. When a fault does occur however, life becomes difficult without service information. A manual (£10) and spare parts are now available from Satellite Surplus (Telford). Give Frank Martin a call on 01952 598 173 for further details. Frank is well known on the Radio Rally circuit, and has all sorts of satellite bargains. ■

Jack Armstrong is willing to try to sort out readers' satellite TV receiver problems via e-mail. You can reach him via the Internet at:

jackarm@netcentral.co.uk

One model per message – state make/model, fault symptom and history. Please mention *Television* magazine and your level of technical competence. If you have no e-mail facilities you can write to him c/o Television, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Please enclose two stamped envelopes.

Test Case 405

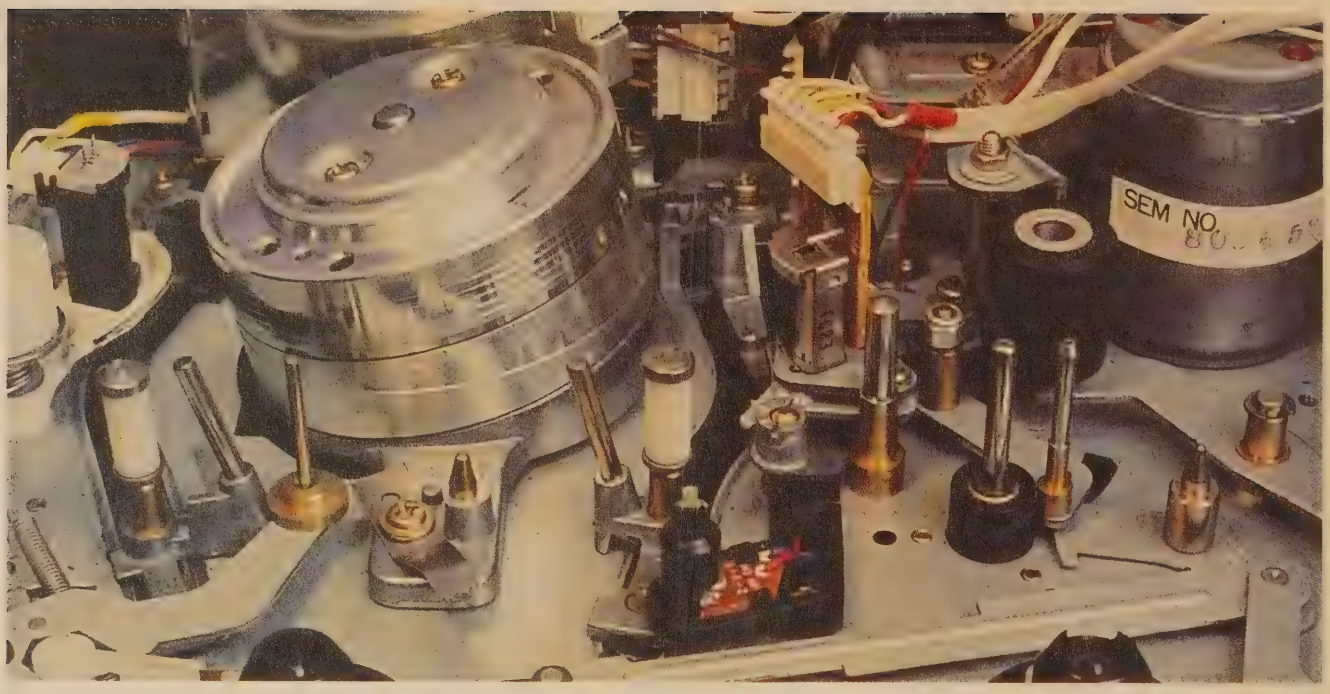
The evolution of satellite TV receivers and broadcast services has been very rapid. While a four- or five-year old TV set or VCR is regarded (around here, anyway!) as relatively new, a satellite box of the same vintage seems to have come out of the stone age. The need to update satellite receivers has been forced on users by the introduction of more channels, extra transmission frequencies, stereo sound, VideoCrypt encoding and other features to which older sets cannot be adapted. In contrast, TV sets and VCRs continue to receive, record and display all that's required.

Despite this there is still some old satellite hardware about, mainly in the possession of those users who don't rent their gear. One such is Mr Todd, whose installation dates from the earliest days of Sky broadcasting. As things have progressed, Mr T has added a separate VideoCrypt decoder and has retuned his sat-box to obtain his favourite programmes within its limited channel capacity. Another problem had now emerged however, one that required our help. While most of the channels he wants were being received reasonably well some of them, particularly the premium movie channels and Sky News, had gradually deteriorated to the point where the pictures were suffused with grain and sparklies. The other channels were also affected when it rained, and retuning hadn't helped. That's what he told our Pam, who sent Doc Colin along in his big van to check things out.

Colin's intention had been to carry out a quick visual check on the installation and bring the receiver back to the workshop for attention. Everything appeared to be OK – except for the pictures on the afflicted channels of course – so the loan receiver was connected up. It was pretuned for use with a standard LNB, so there was no twiddling to be done. But the pictures it produced were no better than those of the original set! Plainly the cause of the trouble was external to the sat-box itself: life is seldom easy these days, even for a delivery/installation technician. Colin departed, promising that another man would come. This turned out to be none other than Colin himself (staff holidays, you know). He brought with him ladders, a field-strength meter and other items. The day was bright, and Mr Todd wondered what it would all cost as he watched our man climb the ladder.

Colin unwound the tape and disconnected the feeder cable. It seemed to be in good condition, unsullied by water ingress. He then plugged in his field strength meter, carefully loosened the dish fixings and checked its alignment. No improvement in the signal level could be achieved. So the dish was once more clamped in position and the reception tried. There was no difference. Back down the ladder then, and back up with another LNB of the same type as the original: we are awash with these, removed from installations that have been updated. The pictures on the afflicted channels were now, if anything, a little worse than before! The polarisation and position of the substitute LNB had of course been carefully checked, and it was known to be in working order.

Perhaps something was wrong with the dish, though it didn't appear to be bent, damaged or distorted. Could there be a fault with the DC supply to the LNB? A meter check atop the ladder showed that the voltage was correct and didn't vary between good and bad channel reception. None of the other faults that occurred to Colin would discriminate between channels, duffing out the Movie Channel while leaving UK Living, Family Channel and others unscathed. So where did the cause of the trouble lie? For the solution, turn to page 819.



Servicing the Samsung VI710

John Coombes on what to check when electronic or mechanical problems are encountered with these popular VCRs

The Samsung VI710 is a basic model, with HQ, that was on sale during the 1988-90 period. A badged version was sold as the Logik VR955.

Power Failure Faults

If the clock display is lit up, the power switch is on but the power indicator light is not illuminated, check that the always 6V supply is present at pin 32 of the UPD75104CW-087 microcontroller chip IC601. If this supply is missing, check whether D601 and/or D602 is open-circuit. Both diodes are type 1N4148. If the voltage at pin 32 is present and correct, check at the power control output pin (56) of IC601 where the reading should be 0V. If this voltage is incorrect, check IC601 by replacement.

If there is no clock display, check whether the always 6V supply is present at pin 5 of connector CN101 on the power supply/regulator panel. Check the following items should this voltage be missing: the mains transformer PT101, the RBV-402 mains bridge rectifier D101 and fuses F101 (500mA) and F102 (2·5A). If F101 has blown, check the mains filter capacitor C101 which is probably short-circuit.

Should the always 6V supply be present and correct, check for 30V at pin 10 of CN101. When this voltage is missing, the following items should be checked: the 1N4002 rectifier diode D104, the KSC945 30V regulator transistor Q102, its 2·7kΩ collector feed resistor R108 and zener diodes ZD101 (24V) and ZD102 (6·8V).

The next thing to check is that the display device is receiving its 5·1V AC supply. Check back to source (at PT101) if this is missing.

There must be a 50Hz signal at pin 8 of connector CN101. If this is missing, Q101 (KSC945) could be open-circuit, D103 (1N4148) could be short-circuit or leaky or R101 (10kΩ) open-circuit.

The STK5333 regulator chip IC101 could be faulty – check it by replacement. If necessary check the fusible resistors FR101 (1·2Ω) and FR102 (2Ω) which could be open-circuit.

Fig. 1 shows the circuitry on the power supply/regulator panel.

No Play

Incorrect or no tape loading is the first possibility here. Check for a high state voltage (4·8V) at pin 53 of the microcontroller chip IC601 and a low-state voltage at pin 52. If these conditions are not present, check IC601 by replacement. If they are correct, check the BA6209 loading motor drive chip IC205 by replacement and then if necessary the loading motor itself, again by replacement.

If tape loading is OK, check the operation of the tape-end sensor. Its output is fed to pin 18 of IC601, where the reading should be 0V. If the voltage is high, suspect the tape. If it is correct, check that the drum is rotating. The first things to check when the drum fails to rotate are that the 15V supply is present at pin 1 of connector CN101 and the 5V supply at pin 4. If these voltages are

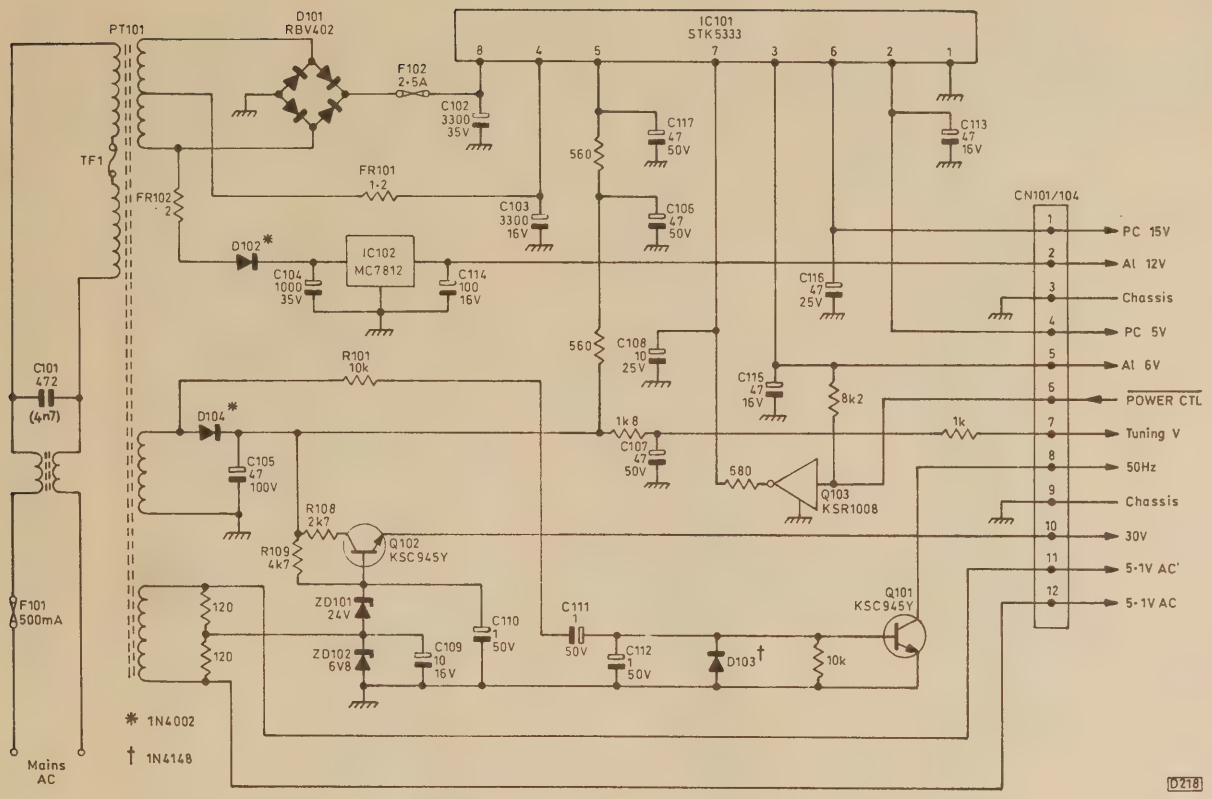


Fig. 1: The power supply/regulator circuitry used in the Samsung Model VI710. Supply line switching is carried out on the main PCB.

present and correct, suspect the microcontroller chip IC601, the BA718 chip IC202 or the drum motor assembly. Check these items by replacement.

If drum rotation is normal but the machine cuts out quickly, check for the presence of the 25Hz switching pulse waveform at pin 1 of IC601. It comes from pin 9 of the SD3624A servo chip IC201. If the 25Hz waveform is not present here, check that the drum PG signal is present at pin 17. Check it back to source if missing (via C211, CN201, CN204, CN214).

If the 25Hz waveform is OK, does the capstan motor rotate? If not and the 15V and 5V supplies are correct, IC601, IC201 and/or IC202 (BA718) and the capstan motor are suspect.

Another check to make if necessary is that turntable reel pulses are present at pin 2 of IC601. If these are missing, Q209 (KSC945) or R251 (470kΩ) could be open-circuit or the reel sensor Q005 (NJL5141EA) faulty – check it by replacement. If the pulses are present at pin 2, check IC601 by replacement.

Failure to Record

If the complaint is failure to record, first check that the machine will play – see previous section.

Insert a tape and press record. Does the record mode symbol appear in the display? If not, check whether the record safety input at pin 9 of IC601 is correct (5V). If this is incorrect, check IC601 and/or the safety tab switch by replacement.

If the record mode symbol is present, check pin 51 (rec) of IC601 where the voltage should be 5V. If it's low, replace IC601.

If these control arrangements are OK, check the video and audio circuitry as necessary.

No E-E Video

Check with the VCR in the stop mode. If the video signal is missing, check the following items: IC0303 (TA8605), C0353 (4·7µF), IC0302 (TA8606), Q0304 (KSA733) and low-pass filter FL0302. C0353, Q034 and FL0302 can go open-circuit. Make sure that the DC conditions around IC0303 and IC0302 are correct. C0366 (100pF) and R0359 (82kΩ), which are connected to pin 28 of IC0303, are possible suspects.

Loss of Playback Video

For playback, the PB5V supply must be present at pin 10 of IC0301, pin 4 of IC0302, pin 13 of IC0303 and pin 7 of IC0307. If this supply is missing, check Q112 (KSA928), Q113 and/or Q114 (both type KSR1004), by replacement if necessary.

If still in trouble use a scope to trace the signal path through IC0303, IC0302 and IC0301. By a process of elimination you'll locate the faulty chip or associated component.

Other possibilites are the TA7772 video preamplifier chip IC0307 and the heads.

Tuning Faults

First check that all channels can be selected. If not,

check that the strobe, clock and data pulses are present at pins 11, 12 and 13 of IC601. Suspect IC601 if they are missing – check by replacement.

Ensure that the data track between IC601 and the tuner is intact. If so, suspect the tuner.

In general, if the IF section is at fault there will be a blank screen, whereas if the tuner is faulty there will be either no picture or a snowstorm.

Deck Faults

The most common deck fault is tape chewing or creasing because the pinch roller is worn or faulty.

If there's no picture, just snow or bent verticals, or hooking over the top third of the screen, check the tension band assembly for wear or damage.

If playback of prerecorded tapes is marred by lines, check that the guide poles are correctly set up, using the FM waveform as a guide.

Tape slowing down or not being taken up by the spools is very often caused by lack of lubrication on the take-up and/or supply spool spindles. Only a spot of oil is required to give freedom of movement.

Wear on the lower drum assembly, though not common with this machine, can be responsible for a rolling picture, picture jitter, intermittent loss of the picture and poor or jerky visual search (usually only in the reverse direction). A scope check will generally show this: loss of contact between the tape and the heads will leave gaps between the sections of the FM waveform.

If there is no play, rewind or fast forward, check the idler clutch assembly for wear. Also the idler belt for wear or stretching.

Check the capstan belt if the picture quality varies. To prevent noisy play or record, ensure that the capstan flywheel spindle is lubricated. Sound variation can be caused by a faulty capstan motor.

If there is a loading fault that's purely mechanical, replace the loading motor assembly, which comes complete.

A worn audio/control head will cause poor/no/low amplitude sound.

Check the front-loading cassette unit if there is no fast forward and/or rewind.

Phototransistors Q003 and/or Q004 (both type PN202S) should be checked if the tape will not start or stop after fast forward or rewind.

Should the VCR fail to function when record is pressed, ensure that the record safety switch is OK.

If the machine won't accept a cassette, check the cassette switch. Failure to accept a tape, with possible grinding of the mechanics, should lead to a check on the side arm gears, the timing gear and the arm gear. Any one of these items may have stripped teeth or broken or cracked cogs. Another cause of failure to accept a tape is a bent or misaligned lid opener. If the loading operates correctly in the manual mode, check IC601 and the loading motor drive chip IC205 – by replacement. If the cassette doesn't drop down straight, or jams, check the cassette holder assembly. It may be bent, or the guide pins may be broken or out of position. ■

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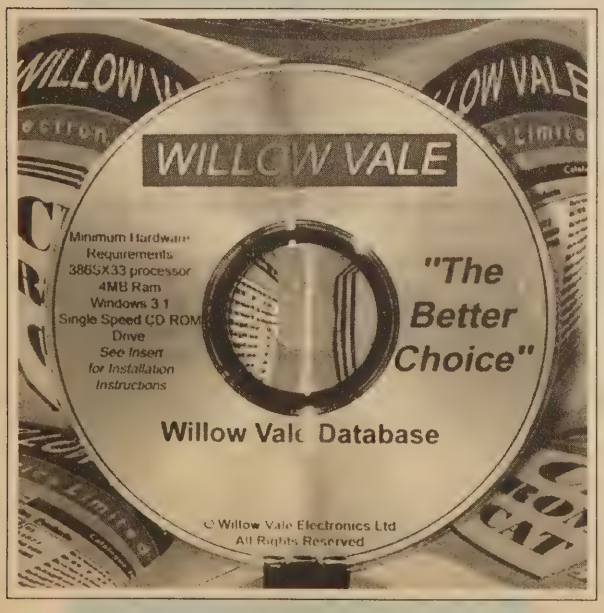

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The Internet

George Cole reports on how it came into existence, how to get connected and the present state of the technology

The Internet is one of the most remarkable developments of modern times. No one knows how many people have access to it, but estimates suggest that the present number is in the region of 35-50 million. More and more people are coming into contact with the Internet, and a growing number of consumer electronics companies are developing Internet products. They include Philips, Sony, Akai and Mitsubishi.

What is it?

Basically the Internet is a worldwide link between computer networks. In practice however it's much more than this. The Internet is one of the largest sources of information in the world, much of it free. Almost anyone with a personal computer (PC), a telephone line and a modem to link the two together has access to the Internet. There is no controlling organisation, though there is an Internet Society. This consists of computer companies, academic bodies and others. It co-ordinates technical developments related to the Internet.

The Internet grew from an unlikely source, the US Department of Defence (DOD). In the Sixties, during the height of the cold war, the DOD drew up a plan to create a network of computers, linking military and academic sites. The network, called ARPAnet, was designed so that if a connection was destroyed by enemy action data could be re-routed via another pathway, i.e. the system itself would survive. To enable different types of computer to 'talk' to each other, a common set of communication codes (a 'protocol') was developed. This is known as the Transmission Control Protocol/Internet Protocol or TCP/IP. It's stored in every computer that's linked to the Internet.

There was spontaneous growth of the Internet during the Seventies and Eighties as more and more government departments, research centres and academic bodies linked themselves to it. During this period the Internet was essentially a communications tool for researchers and academics – users had to operate rather unfriendly Unix computers. If, in those days, you had predicted that people of all ages wound one day be using the Internet you would have been regarded as a good candidate for the men in white coats!

A development by an Englishman, Tim Berners-Lee, in 1989 opened the Internet to the public. He was at that time working at the European particle physics research centre (CERN) in Switzerland. What he came up with was a system that made it easier and more efficient to share information with other computer networks. The World Wide Web, now simply known as the Web, was born.

The Web

The Web is based on a concept, called hypertext, which was created by computer scientist Alan Kay in the Sixties. A hypertext page on a computer screen looks like an ordinary text page, but some of the words are highlighted. This enables pages to be linked. Imagine for example that you are using your PC to read about VCR systems and come to the highlighted phrase 'audio systems'. Click on it with your mouse and you are taken to another page which explains the basic sound systems used in VCRs. While reading this page, click on the words 'depth multplex recording'. You are taken to another page which is devoted to the VHS hi-fi system. The technique gives you easy access to a great deal of related information.

The Web uses a system known as client-server. Some of the computers connected to the internet simply store information. They are called servers. Computers that request information from a server are clients. The Web makes the process of moving between servers much quicker and easier. Go back to your VCR page. The information you called up on VCR audio systems might be stored on a server in the USA while the depth multiplex recording information might be stored in Japan. Other information you might want to call up might be stored in computers in other parts of the world. The Web lets you hop from one server to another at the click of a button. It also creates 'hypermedia links', which means that while some information will consist of text there may also be sound, graphics – even video.

System development

Web servers communicate via a system called 'hypertext transmission protocol (http). Pages are created using an ASCII-based system called 'hypertext markup language (HTML). This explains why Web sites have strange-looking addresses such as

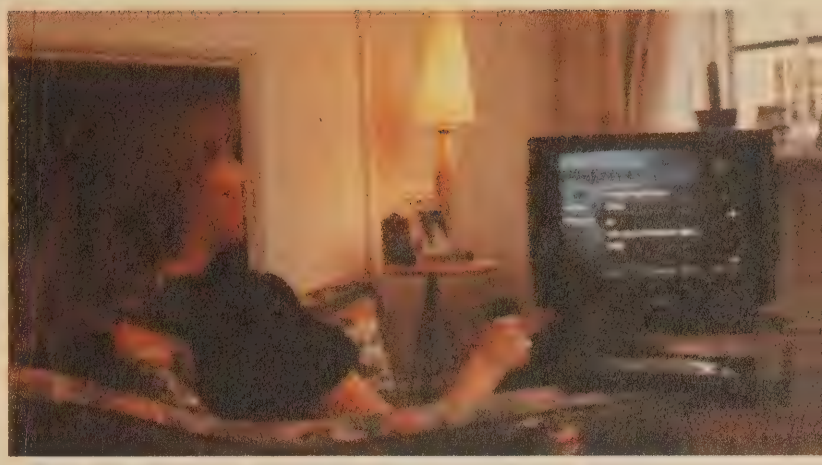
http://www.video.co

Many companies have Web sites nowadays, and addresses are precious things. Microsoft paid around $10,000 for the site address "Slade", which is the name of its electronic magazine. Some people tried to make money by registering the names of large companies, but this practice has been outlawed.

The next step was the creation of a graphical Web interface, or 'browser'. The first popular browser, Mosaic, was created by the National Center for Supercomputing Applications. Other browsers have since come along, the most popular today being Netscape's Navigator. In less than two years this has acquired over 38 million users. A Microsoft browser, called Explorer, is to be built into future Windows operating systems. Browsers are popular because they are free and can be downloaded from the Internet. Browser developers make money by charging companies for the right to create Web pages that their browsers can read.

Another development that helped make the Web popular is the 'search engine', such as those offered by Yahoo and Infoseek. To use them, you type in a few words to describe what you are looking for, such as "television systems": the search engine then looks for all Web sites that are relevant. Some search engines are better than others. You very often get the names of dozens of sites, many of which have little or no connection with what you want.

The Web is only part of the Internet. There is also the Usenet, which consists of thousands of discussion groups concerned with virtually every subject under the sun! Many people use the Internet to send electronic mail. This also involves odd addresses (e.g. joe@netco.com.uk).



Sofa surfing – access to the Internet using the Philips CD-Online system.

Getting connected

For most people, access to the Internet involves the use of an Internet Service Provider (ISP) such as Pipex or Demon, or going via an online service such as CompuServe or AOL. ISPs tend to charge a flat rate (around £10-15 a month) and give unlimited access to the Internet. Online services generally give you several hours of free access to the Internet per month, then charge by the hour. Most people use a local telephone number to get on to the Internet. Despite this, the phone bills can soon mount up!

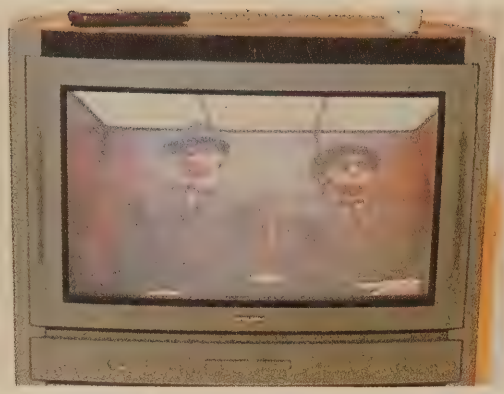
Using the Internet

You'll find almost anything on the Internet. Libraries, government agencies, commercial companies, advertising agencies, newspapers, television programmes and NASA are just some of the organisations with Web sites. The Internet reflects life, so you'll find good and bad things on it. Some governments, including the Chinese, are trying to restrict the public's access to the Internet in order to control free speech and political debate. This has proved to be difficult, as there are so many pathways into and out of the Internet.

The main concern of many parents is pornography sites. They exist, but you have to look hard for them and there are software programs that can help prevent children gaining access to unsavoury material. These packages, which have names like Net Nanny and Cyberpatrol, work by either blocking particular sites (which parents can designate) or looking for particular names. The latter can cause problems. For example Scunthorpe had to change its Internet name to Sconthorpe – I'll leave you to work out why!

The 'Platform for Internet Content Selection' (PICS) was formed by the Massachusetts Institute of Technology's World Wide Web Consortium. It has over forty members, including AOL, AT&T, CompuServe, IBM, Microsoft, Netscape, Time-Warner and Viacom. PICS is a technical standard for labelling Internet sites with respect to violence, sex and language. The idea is to create a universal labelling system that will be recognised by different hardware system and software packages. Labels can be created when a site is being put together, or added by a third party at a later stage. Computers can be set up so that they have access only to sites that are rated say zero for sex and violence.

There are also shopping sites on the Internet, but as things stand few people are making much money out of them. The reason for this is partly the culture of the



Mitsubishi's Net TV, which incorporates a Web browser and modem.

Internet – freedom, universal access and paying nothing for the information! Most Internet transactions tend to be between commercial companies rather than members of the public. For example, company X sells company Y content to be displayed on the latter's Web site. Advertising and marketing companies are looking at ways of using the Internet, and a number of brands have Web sites. But the amount of advertising is so far very small – in May 1996, less than £13 million was made from Internet advertising.

Part of the reason for this is the profile of the typical Internet user – male aged 16-25, though the 30-50 age group is growing as more and more parents decide that the Internet can help with their children's education. Stories about hackers stealing credit card numbers have put many people off buying via the Internet. Visa and MasterCard are developing SET (Secure Electronic Transactions), a system that encrypts data to make bank card transactions over the Internet secure. The Dutch company DigiCash has produced an electronic cash system for Internet payments, and Olivetti has developed an Internet home banking system.

Hardware

Most people use a PC for Internet access, but a number of companies are developing products that use a television set for the display. Database giant Oracle has developed the 'Network Computer' (NC). This is a box that can be linked to a TV set or monitor and uses the Internet for access to and storing data. It has a RISC (Reduced Instruction Set Computer) microprocessor, a few megabytes of RAM but no hard disc – all the software is downloaded from Internet servers. Any documents created by an NC are also stored on the Internet. An NC could be used for wordprocessing, sending e-mail and for access to databases. Its advocates say that it should be much cheaper than a PC, since it uses fewer components – the first NCs will probably cost around £300-500.

Apple, IBM, Netscape, Oracle and Sun were to introduce a Network Computer reference profile this summer, to ensure that different makes of NCs provide a common set of features and facilities. VGA resolution or better was expected to be included, a pointing device, text input capability, audio and various telecoms and Net protocols. A security feature would make it safe to use credit cards and electronic cash with the Internet.

Those working on NCs include BT, Fujitsu, Hitachi, GoldStar, Lotus and Master Card. The UK company Acorn Networks (a spin-off from Acorn Computers) plans to be one of the first to manufacture and distribute NCs, which could be on the market this month (September). Akai has announced an NC called the Internet Connection. It will use a RISC processor from ARM, 4-6 Mbytes of RAM, a 28·8 modem – faster ISDN and cable modems will be used when these become available – and will link up with a TV set, being operated by a remote control handset or an infra-red keyboard. Akai plans to launch it in the USA by the end of the year and says that the cost will be less than $300 (£200).

The computer industry is divided over the prospects of the NC – some wonder whether consumers will want a cut-down version of a PC. But many believe there is a considerable market for products that enable consumers to gain access to the Internet via their TV sets.

Philips was one of the first companies to enter this market, with CD-Online, which was launched about a year ago. The system uses a CD-i player and a connection kit that consists of a modem, a software disc and connecting cables. The disc contains browser software which has been specially developed to improve the presentation of text and graphics on a TV screen. It also caters for music, animations and video clips – media that are slow to download from the Internet. The limitations of the system are that users cannot download and store data from the Internet, while sending e-mail is a slow and tedious business without a keyboard (Philips demonstrated a plug-in keyboard earlier this year however). Unfortunately CD-Online has not been very successful: Philips has closed down its UK operation, though the service is still in operation from the Netherlands.

The lack of commercial success for CD-Online may be more to do with CD-i's failure to sell in quantity than the idea of viewing Web pages on the TV screen. Philips certainly thinks so, and with Sony has licensed technology from the US company WebTV Networks. This will lead to the development of set-top boxes giving TV viewers access to the Internet.

Microsoft and NBC have joined forces to develop a news system that combines TV pictures with Web pages. Earlier this year Mitsubishi demonstrated the Net TV, a set that includes a built-in Web browser and a modem. Companies such as Philips, Nokia and Hitachi have also developed TV sets that can display VGA or SVGA computer graphics.

The future

One thing is certain: the Internet will continue to grow and develop. Web pages will become more sophisticated and interactive, largely because a new programming language developed by Sun Microsystems, called Java, allows developers to create applets – miniature programs that run inside a Web page. As a result, it will be easier to add to Web pages features such as video clips and animations.

HTML was designed for static text and pictures. To view animation or video clips today, you have to download extra programs called plug-ins. Java will enable this to be done seamlessly. If you call up a Web page with a video clip, the applet for tuning it will be downloaded to your PC automatically. When you've finished looking at the page, the applet will be automatically removed from your computer.

One thing on which everyone agrees is that the Internet's data speed is at present far too slow. Even with the fastest telephone modem (28,800 bits/second), it can take many minutes to download pictures, sound or video. Compression systems like JPEG have helped, but use of the Internet will improve when more of us have access to ISDN or fibre-optic telephone links. Some cable TV companies are already installing cable modems that run at rates of tens of Mbits/sec. Some of us might even link up with the Internet via satellite: companies such as Eutelsat, Pace and SES (owner of Astra) are developing satellite data systems.

Even today there are some people who believe that the Internet will prove to be a short-liven phenomenon, like CB radio. But the wealth of material on the Internet, and the relatively low cost of gaining access to it, make this unlikely. ■

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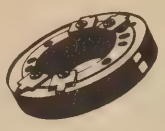

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TV Fault Finding

Reports from Keith Evans, John Edwards, Glyn Dickinson, Christopher Nunn, Michael Dranfield, Paul Hardy, Graham Colebourn and Richard Newman

Amstrad CTV1000

When the customer complains about a thin white line across the screen we usually assume that there's a field timebase fault. This time the line was vertical, which is much less common. Line collapse is usually confined to faulty scan coil connections or a faulty component in the feed to the coils. In this case the dry-joints were at the connections to the line linearity coil L7702, which is in series with the coils and does not have any damping components in parallel with it. **K.E.**

Sharp CV2123H

When power was applied to this set the red LED came on and the standby relay operated when asked, but the set remained dead. The chopper power supply was inoperative because the STR41090 chip had failed. **K.E.**

Sony KVX2532U (AE1B Chassis)

Two of these sets appeared in the workshop within hours of each other. The symptoms with the first one were intermittent loss of video, preceded by a broken up negative picture. Once again there were dry-joints in those IF transformers (T1 and T2). In this second-generation version of the AE1 chassis however the transformers are burried in the IF module, adjacent to the tuner.

The second set had a different intermittent fault, loss of right-hand channel sound. Dry-joints at the audio chip IC261 were the cause. **K.E.**

Tatung 140 Chassis

This tired looking set came in with no picture and uncontrollable motorboating and screeching from its loudspeaker. The power supply seemed a good place to start, and replacing the electrolytics around the TDA4600 chip is always a good idea. We found that the value of C808 (100µF) had dropped dramatically. A replacement restored the picture and sound. **K.E.**

Toshiba 2812DBT

This set was tripping because the line output transformer was faulty. A replacement produced sound and a picture, but there was lack of width and the set wouldn't go to standby. My thanks to Toshiba's technical department, which enabled me to solve the problem in minutes although I'm not an account holder. Correct standby operation was restored by replacing the 2SC2023 transistor Q845 in the power supply: it's in series with the HT feed to the LOPT. The width problem was resolved by adjusting the factory set parameters, using the handset. It would take rather a lot of space to describe this here, but Toshiba technical will explain if you give them a call. Well done Toshiba! **J.E.**

Ferguson TX9 Chassis

When I switched this set on I thought it was suffering from a luminance fault. Blotches of colour relevant to the scene were present, but the raster was very dark, i.e. there was no picture detail. All was clear when I turned up the tube's first anode voltage control – it had no effect.

Although these sets use a diode-split LOPT, the first anode voltage is obtained from a separate rectifier fed from the transformer. R232 (1kΩ), which is in series with this rectifier, was open-circuit. **J.E.**

Toshiba 285T8BZ

Field collapse was the complaint with this set. I found that the TDA8170 field output chip IC303 had a diagonal crack across its body. As the 27V supply was present at pin 2, a new chip was fitted. About two hours later, while the set was being soak tested, it returned to the field collapse condition. This time the 2·7Ω feed resistor R327 had burnt out.

I decided to refer to my trusty but tattered 'rotten faults' notebook. Sure enough there was a note about a modification. I removed D305 and fitted a 47Ω, 1W resistor in its place, then refitted the diode on the copper side of the board. I also replaced the 6·8V zener diode D303, and of course R327. There were no more problems after this. **J.E.**

Sharp C1430H

This set would shut down suddenly four minutes after being switched on. You could almost set your watch by it! Increasing the tube's first anode voltage slightly would immediately instigate the fault. This suggested that there was an excess beam current protection circuit fault. Investigation here showed that R623 (1·2MΩ) was open-circuit. **J.E.**

Ferguson TX10 Chassis

The customer said that this set "went bang then dead". The bang had been caused by C732 (10µF, 63V) exploding. It's the reservoir capacitor for the –40V supply, which is derived from the line output transformer (T721). When a replacement capacitor had been fitted the set worked but tripped intermittently. On investigation I

found that T721's chassis connection pin was dry-jointed. It seemed best to resolder all the pins. After this the set was OK. **J.E.**

Philips 2A Chassis (110°)

"Line on screen" was the complaint with this set, meaning slight top foldover. We had replaced the field output chip IC7570 some months previously, also the associated electrolytics C2571 and C2575. The new parts were checked just in case but were blameless. We eventually found that R3573 in the linearity feedback network had fallen in value. It should be 51kΩ in 110° sets. **G.D.**

Matsui 1455

The cause of a dead set is usually R603/4 or C613. Not this time! There was 300V across C604, and no distress in the power supply. We decided to check the transistors in the discrete-component chopper power supply and discovered that Q602 was leaky. As a precaution, the chopper transistor's base drive coupling capacitor C607 was replaced with a high-temperature component. **G.D.**

Orion W310

This old set displayed a good picture but there was field cramping and reduced height. Although we had no service information I decided to take a quick look and found that a small 4·7µF, 50V capacitor behind the field output transistors looked a bit poorly. A replacement restored the full field scan. **G.D.**

Philips CP90 Chassis

A dead set with the 95V HT supply present was the unusual fault with this remote control model. The start-up 22V supply was found to be very low because C2691 (330µF, 25V) was open-circuit. **G.D.**

Solavox 141

This set produced a snowy black and white picture with lack of height. It seemed reasonable to suspect problems with the multi-function TDA4505 chip IC101, so we started off by checking its supply which was low at 9V. The 12V supply was OK however. The cause of the problem was R104 in the feed to IC101. This 3·3Ω, fusible resistor had gone high in value. **G.D.**

Philips CP110 Chassis (early version)

The owner described all the symptoms of a very poor tube: the picture took several minutes to appear, and when it did it was very dull – even with teletext. Our tube tester disagreed however. We soon found that the contrast control had very little effect on the voltage at pin 6 of the TDA3562A colour decoder chip, but disconnecting the beam limiter made no difference.

A transistor (T7672) that's not shown in the manual is connected to pin 6. It's fed from the 143V rail via a pair of resistors that are also not shown. Ripple on the HT line was switching this transistor on, and hence the beam limiter. Replacing the 22µF HT reservoir and smoothing capacitors C2670 and C2621 cured the trouble.

We've since had the fault with another of these sets. Later versions appear to have this circuit deleted. **G.D.**

Samsung CI5061

"Black band on the left" said the customer. Sure enough, the picture was shifted a couple of inches to the right. There's a phase preset control which is linked to the TDA8361 chip via R420 (820kΩ), with C404 (2·7nF) for decoupling. These two components tested OK, but replacing the capacitor restored the correct picture position. **G.D.**

Toshiba 285T8B

This set was stuck in standby but would apparently come on after several hours. It has two switch-mode power supplies. The main one wasn't starting up despite being asked to do so. There was a supply at pin 9 of the TDA4601 chopper control chip but no output at pin 6. When a replacement was fitted the power supply merely chirruped. It seems that the chip has to be of a certain standard. When a Siemens one obtained from Toshiba was fitted the set worked normally. **G.D.**

Alba CTV3400

Intermittent audio was the problem with this set. Naturally as soon as I went anywhere near it with a scope or meter the fault disappeared. After some careful flexing, heating and freezing I discovered that the cause of the fault was the loudspeaker. The last thing you would expect with a fairly new set. **C.N.**

Ferguson D59F (ICC9 Chassis)

A blank raster with no sound was the complaint, though the on-screen graphics were present and pictures were obtained when a video signal was injected at the scart socket. I didn't have a manual, and horrible thoughts of expensive ICs ran through my mind. I decided to try scope checks, starting at pin 6 of the IF unit. The signal was present up to transistor TX07, which is a chip device, but it produced no output. A replacement cured the fault. **C.N.**

Sharp DV5103H

The chrominance information was displayed about one and a half inches to the right of the luminance information – just as if there was a luminance delay-line fault. The cause of the problem was the small plug-in non-volatile memory chip on the digital PCB. **C.N.**

Sanyo CBP2148

No power up was the complaint. The set came on in standby but refused to come out. A check on the mains switch's momentary contacts suggested that they were OK, so attention was turned to the standby circuit. As I had no luck here I changed the mains on/off switch, though the old one measured correctly. The replacement brought the set back to life! In this set the momentary contacts have to make before power is applied, not after as with many sets. Don't get caught out like me. **C.N.**

NEI 1451TX (Indiana 100 Chassis

This set powered up but there was no line drive. R605 (5·6kΩ, 3W) in the HT feed to the line driver transformer was open-circuit. **C.N.**

Grundig CUC220 Chassis

If the tuning voltage is at 30V and the set won't tune in, the usual cause of the trouble is the U264B prescaler chip in the tuner/IF block. It's now no longer available, but a U644B can be used as a replacement.

To find this item, look under the small screening can. Pin 9 is the output at the edge connector. **M.Dr.**

Hinari TVA1

Intermittent loss of sound was the complaint with this TV/clock/alarm. The set is very similar to the Hinari CT4, but as the TVA1 has a headphone socket a 1:1 isolating transformer is required. This item was the cause of the fault. One of the transformer's pins had been wrapped but never soldered. **M.Dr.**

Grundig CUC2800 Chassis

This set produced low, distorted sound. We traced the cause to the U2829B dual sound intercarrier

chip. It's available from Willow Vale. **M.Dr.**

Sharp DV5150H

If the set trips back to standby after two seconds, replace the 3·3Ω safety resistor R612 right behind plug H, which is connected to the tube base PCB. R612 supplies 28V to the field output stage and seems to go open-circuit for no reason. **M.Dr.**

Bush 3114

There was some sort of field blanking fault with this set: the top part of the picture would be blanked out intermittently, and in addition black lines would run across the picture. A slight tap on the PCB would cure the fault.

A long time was required to sort this one out. It transpired that the field output chip's heatsink earth connection was dry-jointed. Problems of this sort are quite common with the Luxor SX9 chassis, in which use is made of heatsinks to link PCB lands. **M.Dr.**

NEI 1601R

The chopper transistor had blown, also the fuse. As I couldn't find any other obvious fault I replaced these items and sent the set on its way. About a month later it came back with the same fault. A very helpful NEI technical department suggested that I check RP36 (33Ω safety) in the snubber network associated with the rectifier diode that produces the 26V supply. When it fails the result can be excess current in the chopper transformer. Sure enough it was open-circuit, though it showed no physical signs of distress. A replacement restored reliable operation. **P.H.**

Osaki P141

The customer complained about very poor, distorted sound. I replaced the 6MHz ceramic filter and the TDA4505E chip without improving matters, then found that the sound coil T101 could be adjusted over the whole of its range with virtually no effect. I reckoned that it must be faulty, but spares for these sets are like hens' teeth. A check on several circuit diagrams suggested that a coil from the Nikkai TLG100T would be a suitable replacement. This proved to be the case. After fitting one I was rewarded with the sort of audio you expect from a small portable. **P.H.**

Proline 360TT (Tatung 170 Chassis)

The complaint with this set was "loss of colour and going to lines". It was an extremely intermittent fault but did respond to tapping. Lots of bad joints were made good and the tuner was checked as the cause of the trouble seemed to lie in this area. With the scope in action and further tapping I found that the video was being lost after the teletext board. When this board was removed some of the edge connectors were seen to be badly soldered. Reflowing all suspect joints and refitting the board cured the problem. The fault was miles away from the tuner! **P.H.**

Huanyu 37C-3R

The set would intermittently go off, with the mains switch release solenoid operating. I checked the solenoid circuit but it seemed to be OK. What was actually happening was that the power supply was intermittently failing to provide any output. A new STR4011 chip put that right. The mains switch popping out is a characteristic of the circuit. The 40V supply to the solenoid circuit decays more slowly than the 5V logic supply: if the power supply cycles up before the 40V has disappeared, the micro reset caused by the arrival of the 5V supply trips the solenoid. **P.H.**

Philips G110 Chassis

This set was totally dead with the 148V HT supply low at only 20V. A replacement line output transformer restored the set to life, but the picture was far too wide. In addition the width varied with the brightness of the scene – this turned out to be a vital clue.

Disconnecting or shorting out the EW modulator driver transistor Tr7533 proved that the EW modulator was working. The culprit turned out to be the 6·8nF chip capacitor C2526 in the EW anti-breathing bias circuit. It was leaky. We fitted a 100V polyester replacement – the original capacitor was rated at 50V. **G.C.**

Philips CP90 Chassis

This set would sometimes fail to turn on. In the fault condition a whistle was just about audible from the chopper circuit and the voltage on the 95V HT line was only 1·5V. These symptoms arose because the crowbar thyristor Thy6696 was conducting. A check on the three zener diodes in its gate circuit showed that they were all OK, and a new thyristor made no difference. Replacing the electrolytic capacitor C2700 (4·7µF), which decouples its gate, put matters right – even though the capacitor's value measured correctly when checked. **G.C.**

B and O 7423

Every few minutes the picture would gradually lose its colour, fading out to black and white. Then full colour would suddenly be restored. Saturation is controlled by the DC voltage at pin 5 of the TDA3300 colour decoder chip. We found that the voltage at this point fell from the normal 3·1V to only 1V when the fault was present. The cause of the trouble was intermittent contact in the 100kΩ saturation preset potentiometer R42. Incidentally some B and O manuals show the customer brightness and colour controls interchanged. **G.C.**

Matsui 1440A/Saisho CT142RX

The picture suffered from flickery horizontal banding and patterning. This was being caused by HF oscillation in the UPC1378 field output chip. C417, a 15nF capacitor which is connected between pin 4 of the chip and chassis, was found to be open-circuit.

Other models in these ranges use the same circuit and chip, but the component reference and capacitor values differ. **G.C.**

Sony KVM14U

The customer complained about a burning smell and said that the picture had become dim and blurred. Once the back had been removed we saw that R852 (1kΩ) in the first anode (G2) supply had fried to a crisp. The cause was D852, which was leaky. As diode types seem to be very critical with Sony sets, we obtained the correct type from CPC. This and a new 1kΩ resistor restored a really excellent picture. **R.N.**

Philips 2B Chassis

No matter how familiar you are with some chassis you can still come across faults that lead you a merry dance. "Fizzing and smoke" was the complaint with this set. Its cause was the 1·5nF, 2kV (110° version) capacitor across the line output transistor – it had split. A replacement restored life to the set, but there was field collapse.

As I could find nothing amiss initially I replaced the field output chip. This made no difference. I then did what I should have done in the first place and carried out some meter checks around the TDA8370 timebase generator chip IC7550. It

soon became apparent that there was no 12V supply at pin 22, which meant that the chip was running on its start-up supply. R3535 (10Ω) was open-circuit because C2536 (100µF, 25V) was short-circuit. Replacing these two items brought everything back to normal. **R.N.**

GoldStar CIT2190

This set was brought in because it was dead. All that was wrong was a very bad dry-joint at D803 in the mains bridge rectifier circuit. **R.N.**

Philips CP90 Chassis

There was no picture at all, because the tube's first anode voltage was missing. The line output transformer was faulty. It's the first time I have had one fail in this way. **R.N.**

Goodmans 2180

Sound but no picture was the complaint with this set. The HT voltage was correct, but further checks showed that there was no voltage at the collector of the line driver transistor – the primary winding of the transformer was open-circuit. A replacement cured the problem. Spares for this set seem to be available only from Comet. When I asked about the transformer I was told that I was the third person to enquire that day. So maybe this is a stock fault. **R.N.**

Hitachi G8Q Chassis

I've not had much experience with these sets. This one had a dead power supply. Q901 (BUZ71A), Q902 (SGSIF344) and a couple of diodes were short-circuit while R910 (0·5Ω) was open-circuit. A colleague showed me an Hitachi service bulletin that recommends replacement of TH902, Q901, D905, D907, IC901, ZD902, Q902 and R910. Whenever the power supply fails it's essential to replace TH902.

CHS supply a repair kit (KIT HIT 1) that contains all the components required. It's not cheap, so make sure that you allow for this in your estimate. **R.N.**

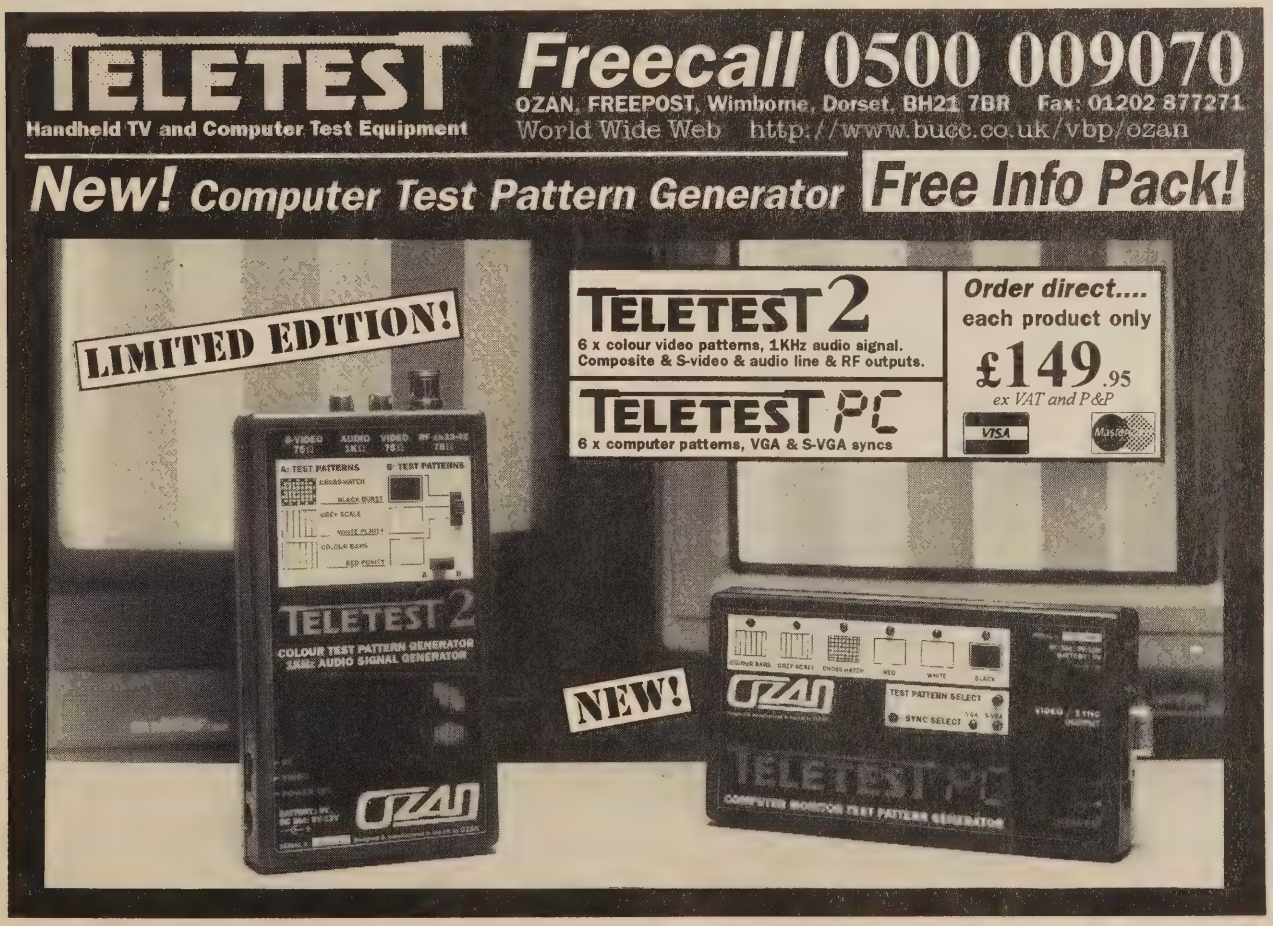
Ferguson TX99 Chassis

The cause of this set's failure was traced to a short-circuit line output transistor. When a new R4050 had been fitted it worked perfectly. Ever mindful of intermittent drive faults however, I left the set on soak test. After about an hour the width would jump in and out intermittently. The eventual cure was to resolder all the legs of the TDA4505 chip. **R.N.**

Telefunken 617 Chassis

This set had been to another dealer who had quoted a ridiculous figure to repair it. I hadn't seen one before, but found a Ferguson/Thomson ICC5 chassis inside. The set thumped three times before it shut down. After checking the usual items in the EW correction circuit I began to suspect the line output transformer. As there appear to be several different types, I decided to order one from a specialist.

With the new transformer fitted, I was rewarded with line collapse and realised that I had accidentally left the scan coil plug disconnected. After refitting this I expected the set to work, but it screamed in a most alarming way. I hastily switched off. A check across the scan coils revealed a dead short. On examining the coils more closely I found that a piece of fuse wire had been very neatly soldered across the tags, thus shorting them out. When this had been removed the set produced an excellent picture. Why this act of deliberate sabotage had been carried out remains a mystery. **R.N.**



HELP WANTED

The help wanted column is intended to assist readers who require a part, circuit etc. that's not generally available. Requests are published at the discretion of the editor. Send them to the editorial department – do not write to or phone the advertisement department about this feature.

Wanted: Emiscope 5in. 3/1 CRT for pre-war TV set. At worst a dud one will do – mine is missing. Also information on the Defiant Model TR947's EHT transformer and a black 9in. CRT mask for this set. Robin Howells, 40 Minster Road, Stourport, Worcs DY13 8AR or leave message with Clive on 01384 872 744 after 6pm.

Wanted: Circuit diagram for the monochrome CCTV camera supplied by Bull Electrical – in particular details of the pin connections (16) to the CCD image sensor. A. Turner, 25 Partridge Green, Pitsea, Basildon, Essex SS13 3EF.

Wanted: Complete, working field output/line oscillator panel for the Philips G9 chassis. Paul Proctor, 22 Toll Bar Road, Christleton, Chester, Cheshire CH3 5QX.

Wanted: Power transformer or panel for the Matsui Model MB10. W. Simmons, 2 Marston Crescent, New Lodge, Barnsley S71 1SY. 01226 732 404.

Wanted: Leader LCT910A CRT tester/rejuvenator for parts, a LOPT for the Ferguson 350000 and a Data Precision 1350 digital multimeter for spares. Pat Foran, Crag, Castleisland, County Kerry, Ireland.

Wanted: IC701 (SC111281) or scrap board, also circuit diagram (photocopy OK), for the Sony D131 personal CD player. Also a capstan PCB for the Hitachi VT410. J. Thomas, 113A Parkgate, Darlington, Co. Durham DL1 1RZ. 01325 487 628 after 6pm.

Wanted: Panel M and LOPT for the Panasonic TC2051 (U5 chassis). Also front display panel for the Matsui 1422 and remote control units for both these sets. R. Kusz, 130 McCracken Drive, Viewpark, Uddingston, Glasgow G71 5ND. 01698 321 037.

Wanted: Flyback transformer type DCF1551 for the Bell and Howell VP1400 and any service information. B. Senior, 1 Bedale Close, Coalville, Leicester LE67 3BA. 01530 832 088.

Wanted: FLH145 IC made by Siemens or information on it. It's a digital chip used in speed counting. Roy Brown, 44a Middle Road, Shoreham by Sea, West Sussex.

Wanted: Circuit diagram or manual for the Scopex 4D10 dual-trace scope. E.A. Coleman, 13 Hazelmere, Bedfont Close TW14 9PX. 0181 890 6796.

Wanted: Circuit diagram/manual for the Pye VK4900 observation camera. Bob Green, Green Electronics, 6 Short Street, Lowestoft, Suffolk NR33 0JJ. 01502 513 960.

Wanted: Service manual for the ITT 3907 VCR. Dennis Leefarrs, Wigmore Cottage, Thruxton, Allensmore, Hereford HR2 9BD. 01981 570 409.

Wanted: Service sheet (photocopy OK) for the Memorex Model 1432R 14in. TV receiver. R.L. Pearson, 6 Eversley, Skelmersdale, Lancs WN8 6DP. 01695 721 957.

Wanted: LOPT (part no. M37 421 M6-318SP) for the Matsui Model MB10, new or second hand. Or details of a possible source. Bernard Sharp, 128a Desborough Avenue, High Wycombe, Bucks HP11 2SQ. 01494 465 899 (home), 01844 342 720 (work).

Wanted: Remote control units for the Selco 21SM.427 CTV with text and the Panasonic NVJ30HQ VCR. R. Flitcroft, 69 Cartmel Court, Blackley, Manchester M9 7HT.

Wanted: Epson PCE and PCAX2 operating and service information. A. Livesley, Beckgatehead, Barbon, Via Carnforth, Lancs LA6 2LJ. 01524 276 276.

Wanted: Program flap and remote control unit for the Akai VS-A77EK. M.A. Foster, 43 St Paul's Close, Aveley, South Ockenden, Essex RM15 4SH. 01708 860 265.

Wanted: An instrument for measuring the strength of magnets and magnetic fields. Have for disposal a pile of pre-1985 TV/VCR manuals. John, TV Hire, 10 Clapham Park Road, London SW4 7BB. 0171 622 7762.

Wanted: Control unit and remote control for a Finlux 562 obc. A. Freeman, 414 Canterbury Road, Densole, Folkstone, Kent CT18 7BH. 01303 892 812.

Wanted: Circuit diagram (photocopy OK) for the Philips CTX-E chassis. S.A. Varden, 18 Drayton Way, Nuneaton, Warwickshire CV10 9ER. 01203 393 010.

Wanted: Circuit diagram (photocopy OK) and parts list for the Panasonic VW-AM10 camcorder AC adaptor/charger unit, also a circuit diagram for the Hinari Model CT5. R.W. Goad, G4EFA, 7 Chipstead House, Chipstead Road, Cosham, Hants PO6 3JJ.

Wanted: Source for a TEA1064A chip for a BT answerphone and an IF panel for the Pye 725 chassis (or can anyone align the one I have?). S. Furley, 3 Ivy Place, Tantobie, Stanley, Co. Durham DH9 9PT. 01207 282 988.

Wanted: I have an ITT Cine Vision TV Projector with no model number. Can anyone identify it? Ron Cavalla, 74 Wendling, Southampton Road, London NW5 4QU. 0171 813 0060.

Wanted: Service manual or circuit diagram for a Western Systems monitor, which was made in Korea. Identifying marks are KEC Model CAE14RG or WS14RGVL. John S. Prescott, 30 Bangor Avenue, Bispham, Blackpool FY2 0HB. 01253 352 429 (after 6pm).

Wanted: Details of the teletext power lead assembly PL615 for use with the Ferguson TX100B chassis and the PC1637-022A remote control PCB. I have a problem linking them to make a retrofit teletext kit work. Jim Doherty, 14 Lovedean Lane, Horndean, Waterlooville, Hants PO8 8HH. 01705 593 463.

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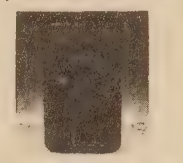
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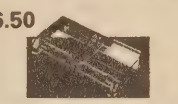

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Satellite notebook

Hugh Cocks on various satellite receiver and reception problems

Corrosion

The owner of a Palcom SL5000 receiver-positioner called the other day with the complaint that it "didn't receive all channels". On investigation I found that the magnetic polariser had gone open-circuit, leaving only the vertically-polarised channels. Straightforward enough it seemed. As the receiver incorporates voltage-operated polarisation switching I fitted an LNB of this type and assumed that everything would be OK. Things are sometimes not that simple however.

While I was tuning through the channels the receiver suddenly stopped at around 1,540MHz, though the on-screen display carried on merrily. Below 1,540MHz, to the bottom of the band, tuning was normal. My first thoughts were that something was wrong with the LNB's oscillator frequency or the receiver's LNB setting. But this couldn't be so, because the frequency display was correct. Time to inspect the innards.

When I opened up this unfamiliar receiver I found that it was sturdily built, with the tuner PCB at the extreme right-hand side. Some corrosion was present at resistors on this board. The owner admitted that a glass of water had gone flying near the receiver a couple of weeks previously, but he thought that the receiver had escaped. There was no sign of any water having fallen on the main PCB, but when the tuner's covers were removed a nasty white corrosion patch was seen near the prescaler chip – on both sides of the board. Cleaning had to be done carefully, as the corrosion was quite bad. But, to cut a long story short, once cleaning had been completed the tuner refused to tune at all!

The simplest solution seemed to be to keep the tunerless Palcom unit as a dish positioner and install a new receiver. The owner readily agreed to this. Since reception from only 19·2°E and 13°E was required, these positions were programmed into 'channels' 1 and 2 of the Palcom unit's memory. The required Astra and Eutelsat channels were then stored in blocks in the memory of a new Pace MSS138 receiver (non-IRD MSS100).

A Modulated MTI LNB

A recent job consisted of adding Eutelsat reception to an existing Astra installation, the owner being primarily interested in the BBC World Service. To avoid sparklies with the weaker Astra channels and the non-Hot Bird Eutelsat channels (including BBC World Service) it's best to use two dishes here. The receiver was a Pace PRD800, with a Global 22kHz tone inserter which was connected to the existing dish IF cable. Both LNBs were linked to the cable via a tone switch.

The problem was that the Eutelsat channels all suffered from good, old-fashioned co-channel type interference, the Astra channels being fine. This ruled out a modulator or terrestrial frequency clash, and was fairly easily diagnosed as 22kHz interference.

I'd seen this before with a tone switch of Far Eastern manufacture. It had been very effective at injecting tone back into the receiver via the flying lead going to pin 8 of the receiver's TV scart socket. Indeed the tone amplitude here had been higher than that going up the cable! The unit proudly displayed a CE sticker of course. Fitting a Global switch had cured that.

But this time I was using a Global unit, which I was reluctant to condemn on site without test gear. As a check I swapped over the LNB inputs to the tone switch and returned downstairs to view the results. There was now no patterning on any of the pictures.

The cause of the problem was that the old MTI LNB, repositioned for Eutelsat reception, couldn't filter out the 22kHz in its DC supply. As a result, its output was modulated at 22kHz. The new Cambridge LNB had improved filtering.

Unfortunately I couldn't leave the LNBs connected this way round, as the Cambridge LNB produced the Astra 1D frequencies while the MTI LNB didn't, and the customer specifically wanted reception of the Dutch 1D channels as part of the refit.

So I had to think of an easy modification to the MTI's power supply! I had PRD800 power supply components with me but little else by way of electronic bits and pieces.

After opening the MTI LNB I disconnected the voltage regulator's input, inserted a 1Ω series resistor and added a 22µF electrolytic decoupler from the input to chassis. For good measure, as space was available, I also added a 22µF electrolytic at the input to the resistor.

When the LNB had been reassembled I tested the installation and found that the additional filtering had completely removed the patterning when the tone was active. Panic over!

More LNB Trouble

We seemed to have more LNB trouble last winter than during the previous ten years put together. Excessive rain and lightning didn't contribute to reliable operation of course, but new LNBs seem to be much less reliable than older ones. Does anyone still remember the Japanese DX DSA508 of 1984/5? It was built like a battleship, had a 3dB noise figure, and cost in the region of £500. But it never went wrong. A fairly large dish was required to compensate for its high noise figure – but I digress . . .

A system that's been giving us a lot of trouble recently consists of an 85cm offset dish with a Cassegrain type feed assembly. These dishes

were installed a few years ago, and the original suppliers are no longer around. The LNB is mounted on the feed arm, pointing at the Cassegrain subreflector. In time the feed cover deteriorates and, because the LNB angle is quite high, water gets in when there's a heavy rainstorm. This produces the no picture complaint.

LNB replacement works, but the same problem will inevitably return (whether before or after LNB failure as a result of lightning is another matter).

If you explain the problem to the customer, he usually agrees to having a standard offset dish installed along with the new LNB.

A Silent Pace SS9000

The owner of this receiver complained that the sound had disappeared the previous evening. Operation had been OK prior to this.

With the unit on test in the workshop I found that sound was present at the output from the demodulator chip U1. I then traced the signal through U11, U12, U13 and U14. Though both left and right channel sound was present at the input to the LM324 operational amplifier U15, almost no output could be seen on the scope's display. A new chip restored the volume.

The receiver's power supply seemed to be perfectly OK – it obviously lived in a fairly cool environment. I changed C9 (1µF) in the power supply as a precaution, also C29 which was the cause of faint diagonal lines on VideoCrypt channels. C416 (in the tuner), which is the major cause of "lines on the picture" in this model, had already been replaced.

Lucky Connexions CX95A

This receiver was used in a holiday rental home where it lived on top of the TV set in a rather precarious manner. Its owner hadn't taken into account small children. As a result it ended up falling on to a hard floor while switched on. Naturally enough it refused to work after this.

Being fairly robust, the cabinet had survived well. The main mechanical problem was that the VideoCrypt decoder had become detached from the plastic spacers which secure it to a metal plate on top of the main PCB. I replaced the 1·6A fuse F2, which had blown, and switched on. Fortunately everything worked. The plastic spacers for the VideoCrypt decoder were then glued on to the metal plate.

I returned the receiver and installed it on the floor beneath the TV set. At least gravity wouldn't cause any damage! When I plugged it back in however there were virtually no signals from the dish. In all likelihood this was the original reason for the kids pushing the front panel buttons so hard that it fell down.

The 1·2m fixed Astra dish was suffering from the aftermath of near hurricane-force winds the month before. It had blown off course, while in addition spiders had taken up residence in the prime-focus feed, helping to attenuate what little signal was present there. After repeaking the dish and clearing out the spiders I sealed the feed with a thin piece of polystyrene, to stop them entering again.

The Connexions remote control unit has too many tempting buttons for holiday rental use, and no tuning lock facilities. I solved this problem by dismantling the unit and sticking insulating tape on all the PCB areas concerned with tuning. This provided normal use but with the tuning buttons inactive.

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Toshiba V254

This machine produced some odd symptoms. There was no E-E sound, and with its own recordings the head switching line floated up and down the screen. The playback picture and sound with a known good tape were OK.

A check at the audio mute test point BS004 showed that the mute line was active (the reading was 5V). So attention was directed to the main microcontroller chip IT001. As expected, the voltage at the audio mute pin 16 was high. Checks on the video inputs to the chip showed that there was no signal at pin 70, the composite sync detect pin. This input comes from pin 42 of IV001 on the other side of the board, where the signal was present. When we traced along the track we found that the signal was lost after the wire jumper above RV139 (by the cut out in the PCB for the drum motor). Bridging the break with fine wire restored normal operation. **P.B.**

JVC HRD540

This VCR was apparently dead with no clock display. Checks showed that the unswitched 12V and 5V supplies were present but not the switched 12V and 5V supplies, and there was no power-on signal to the main micro IC601. If the power-on line was taken low manually, the switched supplies appeared but there was still no go. The microcontroller chips seemed to be getting all their supplies, but there were no strobe pulses from micro IC1 to the clock display. I took a chance and ordered a UPD725216ACW-A35 from JVC. Fitting it restored normal operation. **E.B.**

Panasonic NVJ30

If the problem is dark/pulling E-E and playback pictures, check for dry-joints at the RF converter. **E.B.**

Samsung VI711

There was no sign of life – no display or operate light. All the power supply output voltages were present, but the /power control signal at pin 5 of CN101 was, at 2·4V, in neither the high nor the low state. I tried replacing the STK5333 power chip and digital transistor Q103 before delving into the microcontroller circuitry.

IC601's supply was present, but there was no oscillation at pins 46 and 47. It was possible to instigate oscillation, sometimes briefly and sometimes for a longer period, by holding crystal X601 with one's fingers. When oscillation was present the machine worked normally.

I assumed that the crystal was faulty and fitted a replacement. A soak test suggested that everything was now OK, but a few days later the machine was back with the same symptom – dead. It could still be coaxed back to life by touching the crystal, or by briefly shorting the 5V supply (Vdd) to chassis.

This led me to suspect that the cause of the trouble was in the reset switch stage. Transistor Q601 wasn't faulty, but C612 (22µF, 35V) certainly was! A further soak test proved that this time my diagnosis was correct. **E.B.**

JVC HRD540

This VCR was completely dead: no LED display, no clock, nothing! Full HT was present at C12, but there were no outputs on the secondary side of the chopper transformer. Q1 (2SC4517) was open-circuit. Replacing this item restored the machine to life. **D.C.**

Akai VS248, 249, 250

If the complaint is poor quality recording and playback, before you change the drum check that the small earthing screw in the middle of the PCB, under the metal screen that covers the video preamplifier, is fully tightened. **C.H.**

Samsung VB920

This machine would sometimes cut out after a couple of minutes for no apparent reason. On other occasions it would run perfectly for hours. Replacing the 12V and 5V regulator chips, IC1 (S3122) and IC2 (AN7805) respectively, put an end to the trouble. **C.H.**

Akai VS18, 19, 22, 23, 24, 34, 35

If the drum motor takes off at high speed, or play stops after a few seconds, suspect the BU2375 digital servo chip IC503. It tends to be damaged when the voltage at pin 28 (5V) goes high because of a power supply fault. As this chip is expensive, it's a sensible precaution to add a 6·2V, 1·3W zener diode across C9 (100µF, 6·3V) in the

supply to pin 28. There's room on the reverse side of the power supply PCB, near connector P1. **C.H.**

JVC HRD600, 620, 650/ Ferguson FV37H, FV43H

There was no problem about getting the tape around the heads, but the machine refused to give the tape back unless it was disconnected from the mains supply. It seemed that either the mode switch or the servo chip was the cause of the trouble, but before we dived in at the deep end we sent a search party to look at the lower deck during tape loading. The cause of the problem became apparent after several attempts at loading. Because the toothed part of the plastic sliding bar (item 39) didn't engage correctly at the end of its run, the full loading sequence could not be completed. Plastic circlip item 40 was the cause of the trouble: it had gone on holiday. **C.H.**

Matsui VX1000

The customer complained that "half the old programme showed". We found that the tape failed to make proper contact with the full erase head because the back-tension arm didn't move to its correct position. The cure was to grease the operating lever that contacts the back-tension arm and check the back tension. **M.M.**

Panasonic NVJ35

There was a display problem with this machine. Several segments were permanently lit up. Our experience has been that this fault is usually caused by the display itself or one of the diodes connected to it. Not on this occasion however: the microcontroler chip IC7501 was faulty. **M.M.**

Sanyo VHR350E

This unit was dead. We found that the two 560kΩ start-up resistors R5005 and R5006 were both open-circuit. Replacements restored the machine to life. **M.M.**

Akai VSG64

The customer's complaint was that most tapes wouldn't play properly – the off-tape pictures rolled. Her husband, who is a computer engineer, mentioned that if he twiddled the left-hand guide this would sometimes temporarily stop the rolling. My rule is that if the guides are tight, why should they have moved from the manufacturer's settings? In fact the cause of the fault was poor head-to-tape contact. The user confessed that the machine led a hard life, being constantly in use. A new upper drum, together with slight realignment of the entry guide, restored normal working. **M.M.**

Mitsubishi HSB20

This machine had been to another dealer who, despite replacing the loading belts, had failed to cure the fault – intermittent failure to accept a tape. The cause of the trouble was the cassette-in switches on the front of the loading unit. A replacement, part no. 439C021010, cured the fault. **M.M.**

Osaki VCR33

The following note illustrates what can happen when incorrect parts are fitted. Intermittent tape chewing and going into the fault mode was the complaint. Now this model is a GoldStar clone and uses a deck that bears an uncanny resemblance to the Panasonic D mechanism. On inspection we found that the gear which is part of the plate assembly A10 had split. So we ordered one and fitted it. The machine then appeared to work correctly – until the bottom cover was fitted, when the fault returned.

To cut a long story short, we discovered that the loading motor from a Panasonic deck had been fitted. Its pulley fouled the bottom cover, which was minus some of its screws, thereby stalling the motor. All was well when the correct GoldStar loading motor was obtained and fitted. **M.M.**

JVC HRD230/Ferguson FV12L

Intermittent failure to play or record was the complaint with this machine: the tape would lace up, but the drum wouldn't rotate. Voltage checks showed that the Motor 12V supply and the motor drive and motor run voltages were all present. When I removed and dismantled the lower drum I found that the ICP on the drum motor's PCB was dry-jointed. Resoldering provided a complete cure. **M.M.**

Hitachi VTF770

This machine wouldn't eject tapes. Fortunately the cause was simply a slipping belt. **M.M.**

JVC HRD230/Ferguson FV12L

This machine would intermittently stop while in the play or record mode. On test it appeared that the capstan motor was stalling. As there was no stiffness in the motor I came to the conclusion that it had a dead spot. A new motor cured the trouble. **M.M.**

Samsung SI3560

This machine's carriage didn't sit properly when a cassette was loaded and ejected the tape with the force of a bullet! When faced with this problem the usual procedure is to replace the eject gear and the right-hand side carriage bracket, which has been modified. All was revealed when we stripped the machine down. Another 'engineer' had tried to repair the bracket by using a large self-tapping bolt to mount the side plate's drive gear! A new eject gear and bracket restored normal operation. **M.M.**

JVC HRD150/Ferguson 3V45

This machine would sometimes fail to go into the record or playback mode, switching itself off in the loaded state. The cause of this is usually hardened grease and a worn belt on the loading block, but a replacement block failed to cure the fault. An optosensor that's fitted to the underside of the deck was the cause of the trouble. **M.M.**

Samsung VI730

Dropouts were the problem with this machine – the symptom was long, black streaks that ran across the picture. As a start we decided to set up the CCD level control as laid down in the manual. Connect a scope to TP3303 and adjust VR3301 for a video level of 0·6V peak-to-peak it said. In fact the video signal was missing at TP3303, though it was present at pin 4 of the 1H delay chip IC3302. The only item in between is a 3MHz low-pass filter, FL3303, which was open-circuit. We took one from a scrap machine and after setting up the dropout compensation operation was back to normal. **M.Dr.**

Sharp VCA33

If tape spills out during play, i.e. there's no take up, try a spot of fine oil on the idler shaft, where the idler gear slides up and down. It tends to become a bit sticky and fails to reach the bottom. This note applies to all machines that use this deck. **M.Dr.**

Akai VS77

This machine stopped after five seconds, indicating a take-up rotation fault. We cleaned the underside of the reel disc, but the fault remained. A scope check at the

take-up sensor showed that the amplitude of the pulses was only 3V peak-to-peak – it should be 5V p-p. Presumably the LED part of the sensor had lost emission. A new sensor restored the amplitude and correct operation. **M.Dr.**

Samsung VIK310, 320, 350, 375

Further to my note on power supply failure with these machines (see page 658, July), a 100µF, 25V capacitor rated at 125° can be obtained from Farnell Electronic Components of Leeds (01132 636 311) for use in position C110. It's made by Philips and the part no. is 286-709. **M.Dr.**

Saisho VRS5000

This machine appeared to be dead, as there was no clock display. But if a tape was inserted it would half load then stop. Still no display however, and eject didn't work – the tape had to be wound out. The drum would sometimes rotate when a tape was inserted, and would continue for four-five minutes. The power supply seemed to be OK, though the switched outputs couldn't be checked.

Checks at the tuner/timer chip IC601 showed that the 5V supply was present. All the display drives were at –28V. No key scan pulses could be found. We then discovered that there was no activity at crystal oscillator X601. A new crystal restored normal operation. **C.W.**

Amstrad DD8900

Various display segments flickered and the control keys were either very slow to act or produced the wrong function. The stop-eject key initiated forward wind for example. A look at the circuit diagram showed that the display drivers operate with a –27V supply. The display outputs are also connected to the key lines. So a supply problem was suspected. A check showed that the voltage was low at only –15V. Replacing C27 (47µF, 50V, 105°C) cured both problems. **C.W.**

Bush VCR190

This double-deck machine came to us with a list of intermittent faults. They included won't accept a tape, won't eject, won't play, sometimes stops during rewind and sometimes switches off – all with the bottom deck, as is usual with twin decks. I pounced on the mode switch like wildfire, but this was a waste of time. By watching what happened when a fault symptom occurred I saw that the capstan motor seized. Stripping it down then cleaning the bushes and oiling them cured the fault. I then lubricated all the moving bits on the bottom deck and, to be on the safe side, did the same with the top one. **C.W.**

Mitsubishi HSM50

Rows of white spots marred the playback picture. We removed the deck and checked the static discharge arrangement, which appeared to be OK. The large screened PCB along the back of the deck was loose however. Three screws secure it and provide earthing. Tightening the screws solved this one. **C.W.**

Samsung VI611

In any mode the tape would run for only about a second. The machine would then go into the 'emergency state', with the standby LED flashing. The cause of the fault was in the rotation sensor section. As cleaning made no difference, we checked at pin 3 of the sensor – you can see it when the bottom cover is removed. A squarewave was present when the disc was rotated, but its amplitude was only 2V. A new sensor (part no. 62309110243) produced pulses of greater than 4V amplitude, the signal now reaching pin 55 of the syscon chip. This restored normal operation. **C.W.**

Mitsubishi HS551B

This machine would run for only a few seconds in any mode then stop. A check showed that the take-up reel pulses were missing at pin 92 of the microcontroller chip. When we examined the connections to the reel sensor (Q5E4) we saw that three of its legs were broken. **A.F.**

Mitsubishi HSM20V (J Deck)

We've had two of these machines, both rental models, with broken loading gears. Although the fault is reasonably easy to put right, provided you are not interrupted, be careful that item C 053 plate cam B has its full complement of teeth. Is it the machines, or are the customers too rough? Time will tell. **A.F.**

Ferguson FV30B

This was another machine that would run for only a few seconds in any mode. A check at test point BT15 showed that the supply reel pulses were of low amplitude and tended to be erratic. A complete clean of the clutch assembly and the sensor cleared the fault. **A.F.**

Panasonic NVSD200

Very low E-E audio was the complaint with this machine. I found that one end of C0729 in the VIF pack was dry-jointed – it's the detector audio output coupling capacitor. Interesting that the other end had clearly been soldered manually! **N.B.**

GoldStar GSI12901

The E-E sound and vision were affected by severe hum. There was slightly less hum in the playback mode. The culprit turned out to be C118 (470µF, 25V). It took a while to find, as I didn't have a circuit diagram. **N.B.**

Panasonic NVJ30

As the combined remote control/bar scanner handset (part no. VEQ1107) for these machines is an expensive item, repair is usually economic. This one seemed to be dead, though the chips were being supplied. There was no clock signal at pins 15 and 16 of the microcontroller chip IC1 however. Crystal X1 (3·52MHz) was faulty. **N.B.**

Fisher FVHP445VK

This non-UK machine is similar to the **Sanyo VHR5200E**. The one brought in by a customer wouldn't come out of standby. Checks revealed that the switched 5V supply was missing. Q5402 (2SC3070) turned out to be short-circuit base-to-emitter. **N.B.**

Panasonic NVFS90

The complaint was no S-VHS playback or record – standard VHS was fine. When I traced the luminance path through I found that the signal entered the hybrid chip IC303 (VEFH05BT) at pin 2 but nothing came out at pins 7 and 8. The cause of the trouble appeared to be that one of the aluminium can, surface-mount electrolytics in the module had leaked. A replacement IC cured the problem. **N.B.**

Panasonic NVL25

When this machine was put into the standby mode the vision remained and the red LED stayed alight! The cause of these interesting symptoms was a splash of solder that shorted the cathode of D1002 to an adjacent wire link. As a result the switch line to the power supply didn't change state. **N.B.**

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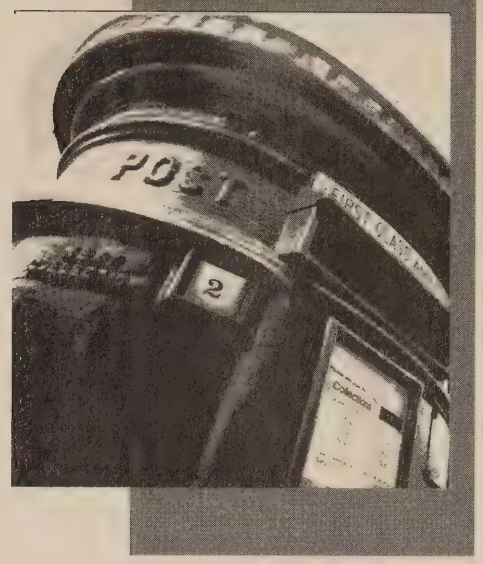

We welcome letters from our readers and try to publish as many as we can. You can send them typed, hand written, or on disc – addressed to the Letters Editor, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Installing Aerials

John Pitt-Francis (July issue) is probably a well-qualified and respected TV repair man, but I wonder whether he would appreciate an "aerial riggers' guide to branching out into TV, VCR and satellite repairs" along the lines that all you need are a set of screwdrivers and a soldering iron?

I like his rule about aerial installation being "good weather activity". In my sixteen years' experience, this would add up to about six weeks a year in which to make a living! A part-timer would have just long enough to recoup his stock investment. If you decide to align satellite TV dishes correctly – to avoid calls about "sparklies whenever it rains" – a frequency-specific meter is required. It will mean that you can forget about any profit unless the rain holds off for a complete year!

The use of ladders is not a matter to be taken lightly. It requires consideration of Health and Safety issues and minimum insurance needs. John Breeds devotes a complete chapter to the subject in his latest book, while the Confederation of Aerial Industries has spent seventeen years evolving Codes of Practice relating to the whole business of quality aerial installations.

On January 1st 1997 Channel 5 should be available to around 74 per cent of the population of the UK. Without going into detail, a wideband masthead amplifier providing a gain of 24dB will, in the hands of the uninitiated, provide a lot of people with a lot of entertainment – but not the public!

The stock list suggested by John is going to look a bit sick in many areas of the UK, not to mention the disasters that can occur with his list of splitters.

John's article has made some of us who have devoted a lot of time and effort into raising the standards and respectability of the aerial industry a touch cross. The CAI spends a great deal of time meeting broadcasters, regulators and now MPs to discuss how new technologies will affect our industry. A TV set is only as good as the signal it receives. The public is being educated by the media on how to complain – so don't set yourself up as a target. Leave our profession to the true professionals.

Tim Jenks, CAI Inspector, Wolverhampton, W. Midlands.

I feel that John Pitt-Francis's article on aerial rigging may have created the wrong impression, suggesting to readers that it's a simple, mechanical business that requires little scientific understanding. Aerial installation without a signal strength meter for example is highly dubious – how would you check all channel levels, to ensure a reasonable balance, or the sound-vision ratios? There are many things that the TV set won't tell you. Because signal conditions can vary, you may get a call back when, for example, the pressure changes. A correctly sited and aligned aerial will minimise such possibilities. When it comes to a satellite dish, how on earth can this be set up accurately without a meter?

Reception in poor-signal areas in particular requires skill. In a recent case I was asked for advice where reception in a valley location had not been improved despite fitting a larger aerial atop the nearby hill and a higher-gain masthead amplifier. I discovered that a local relay was being received from the back of the aerial, despite the polarisation being incorrect! Because the masthead amplifier was a wideband type, these four extra channels made the amplifier work flat out. The solution was to fit a channelised amplifier.

An omni-FM aerial sounds a good idea – but only where you have very good signals.

In my opinion set-back amplifiers are a bit like head-cleaning tapes: a great seller as a consumer item, but of little or no use to the professional aerial installer. The amplifier should be close to the signal source, i.e. at the aerial. One use for a set-back amplifier is to drive a splitter, or overcome cable loss with a long feed used to pipe say a VCR's or a satellite receiver's output around a property.

Insurance and regulations are important matters that were not covered in John's article. Ladders must meet the regulations for industrial rather than domestic use, and must be of a type approved by your insurance company, which will need to be informed should you decide to take on extra types of work, especially anything as hazardous as aerial rigging. The insurance company will place restrictions on maximum working height and the types of weather in which you can work (wind speed etc.). This will apply to your public liability insurance, which may well need to be extended, and your personal accident insurance.

There are now also regulations relating to vehicle ladder racks – their strength and mounting. Police have in this area been stopping drivers and checking racks. Some vehicles that are popular in this industry do not, in standard form, meet the mounting requirements for the ladders we typically use.

In omitting so many things, John's article could be very misleading. The true professionals in this field deserve every respect. There is no short cut to becoming a competent aerial installer.

Nick Beer, Bideford, N. Devon.

Going It Alone

It was good to see both positive and negative reactions to my two articles. I agree that an inspection fee is the right approach, which I adopted

from the start. New customers have to pay this up-front. I didn't mention insurance but did, in my first article, strongly recommend getting the free business advice offered by the Training and Enterprise Council, as explained at all jobcentres. This covers the legal aspects of running your own business as well as many other topics. Public liability insurance and carriage of goods are legal requirements. Planning consent is a greyer area: it applies to an exclusive change of use, which is another reason for my suggestion of shared use.

On the subject of aerial rigging, I cannot go along with the suggestion that a meter is essential for alignment. Easier perhaps, but it's unlikely that the dozen or so nearby aerials are all pointing the wrong way! This, along with a geographical knowledge of where the transmitter masts are, has never yet failed me.

Excessive signal strength is the most misleading situation I encounter. In my locality, Stockland Hill has in recent months been pumping out Ch. 23 (ITV) at about 9dB higher than the weakest channel in the group, BBC-1 on Ch. 33. This can cause overloading, particularly with the low-power relays such as Honiton and Beer, which do not appear to equalise the error.

Newcomers to the trade will find it helpful to rig up a system to demonstrate the effects of overloading, so that they can spot it. See Fig. 1. BSS 1984 recommends input signals between 1mV and 10mV (peak), which is a swing of roughly 20dB. Your test TV set will be taken well above this limit as you remove the attenuators from right to left, one by one, though some sets will handle it quite well. So you may need an extra cascade! Space all amplifiers well apart.

On one occasion I received a call to a very prestigious house in Sidmouth, where this problem was present. A professional rigging company had gone overboard in providing a cascade amplifier and top-of-the-range distributor to many rooms. The result was messy pictures, because of co-channel and coastal radar interference. Removal of the head-end amplifier was all that was required to obtain excellent results. Knowing this earned me a customer for life. Do I make my point?

John Pitt-Francis,
Honiton, Devon.

I read with interest John Pitt-Francis's article (June) on starting your own repair business. Having run my own business for some years now, I consider that the advice given was very helpful and informative. There are however a couple of suggestions I would like to add to help the new-comer.

First, 'street cred' is all important these days. Creating a good image from initial contact with the customer right through to his paying the bill will mean that he is likely to spread the word, bringing in more customers. I've found that referrals from satisfied customers are by far the most common way in which my customer base has been built up. In this respect I've also found that being able to offer payment by Credit Card is a facility that many customers look and go for, especially with the more expensive repairs. It adds a bit to the overheads, but is well worthwhile. I've also been told that being VAT registered, even though you might not need to be because you do not meet the turnover requirement, adds to credibility. This is a big step to take however and shouldn't be done lightly.

Secondly, John mentions various options for obtaining service information. I had the same bad experience with a manuals library some years ago but, recognising the value of such a facility to repairers, I decided to start my own manuals library. This has been running successfully for some three years, with hundreds of members to date. Joining a library is probably the most cost-effective way of gaining access to thousands of manuals, many of which may not be available elsewhere, especially for equipment that's getting on a bit.

Another benefit is that it can help to have a 'sparring partner' when the fault is an elusive one. Being in the trade myself, I can offer such a service to members and can obtain help from other members, particularly dealers for specific manufacturers.

More and more manufacturers are closing their doors on technical support (and, in some cases, even spares supply) to anyone who is not an authorised dealer, making it even harder for the independent repairer to run a successful business. But there remain many of us willing to help in whatever way we can.

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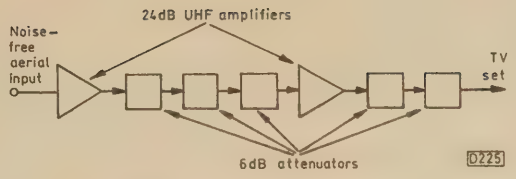

Fig. 1: Amplifier/attenuator arrangement to demonstrate the effects of overloading. The aerial input is assumed to be noise-free and at least 6dB up from threshold.

Monitor LOPT Query

In his note on the Philips CM11342 monitor (August, page 754) Edward Branch asked why the LOPT with which he was supplied was wired differently from the original. I'm tempted to say "because it's a Philips", but I suspect that he may have used the CPC TF027. I did this and was presented with the same symptoms for the same reason – pin 7 being connected to chassis. My solution was to fit the HR replacement, HR7533, which although apparently delisted from the CPC catalogue was still available at the time of writing. This has pin 7 wired correctly for beam limiting.

Incidentally I'm told that CPC intends to stock the entire range of HR transformers in the near future. Now there's a bit of good news.

Adrian Spriddell,
Micomicon Electronic Services,
Diss, Norfolk.

NEXT MONTH IN TELEVISION

Test Equipment Supplement

The test equipment required for today's TV/video servicing – a guide to what you need for efficient work as we approach the twenty first century.

Multi-satellite Reception

There comes a time when reception from one satellite leaves something to be desired. After all, there are many alternative sources of satellite signals. So dish positioners and actuators have to be considered. Next month J. LeJeune describes what this involves, the technology and how it operates. Our new series deals with practical installation and maintenance.

VCR Take-up Problems

The tape take-up mechanism in a VCR gives rise to many different problems, some obvious others less so. Nick Beer considers take-up configurations and failures, also the principles involved.

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2N4123	0.30	2SC945	0.12	BA718	1.08	BD234	0.24	BU807	0.51	HA13151	13.20	STK4141II	10.23	TDA1670A	2.98	TEA2018A	2.29
2SA1013	0.35	2SD1207	0.57	BAT85	0.96	BD237	0.31	BU908	1.68	HA51338SP3	7.69	STK4142II	9.40	TDA1675A	3.85	TEA2029C	7.04
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2SB772	0.50	2SD401A	0.77	BC308	0.09	BF324	0.18	BY227	0.13	M5218L	0.69	STRD1816	7.69	TDA2653A	4.70	TIP36C	2.14
2SB774	1.61	2SD468	0.28	BC308B	0.19	BF391	0.18	BY228	0.26	M54544L	2.04	STRD4420	11.49	TDA3301B	6.75	TIP41C	0.65
2SB891	0.60	2SD669A	0.64	BC309C	0.14	BF420	0.21	BY2291000	1.31	M58655P	4.96	T9053V	1.35	TDA3505	2.40	TIP42C	0.50
2SB892	0.35	2SD716	1.63	BC327	0.10	BF421	0.24	BY229800	1.08	MC13002P	7.69	T9064V	1.87	TDA3560	3.86	TIPL760A	2.57
2SC1213	0.14	2SD756	0.47	BC328	0.14	BF422	0.19	BY255	0.14	MC14066B	0.21	TA7205AP	2.87	TDA3561A	5.30	TIPL761A	1.85
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2SC2001	0.23	74HC04	0.34	BC546B	0.12	BF487	0.57	BYD33M	0.26	MJE3055T	0.74	TA8201	3.93	TDA3650	12.82	UC3842	1.46
2SC2023	3.18	7805	0.78	BC547	0.11	BF759	0.38	BYV10-40	2.55	MJE340	0.45	TA8205AH	4.50	TDA3653B	1.54	UC3844	1.20
2SC2060	0.30	7808	0.72	BC547A	0.04	BF763	0.23	BYV95B	0.21	MJF18004	2.05	TA8207	2.74	TDA3653C	2.55	UC3844N	1.91
2SC2078	1.00	7809	0.69	BC547B	0.11	BF788	0.52	BYV95C	0.21	MN650	3.30	TA8210AH	4.10	TDA3653CQ	2.57	UPC1230H	3.40
2SC2120	0.23	7812	0.52	BC548	0.06	BF869	0.25	BYV96D	0.27	MPSA06	0.35	TA8210H	4.79	TDA3654	1.38	UPC1318AV	3.85
2SC2230	0.55	7815	0.82	BC548A	0.11	BF869S	0.48	BYV96E	0.53	MPSA42	0.23	TA8215H	4.96	TDA3654Q	2.82	UPC1365C	1.70
2SC2235	0.36	78L05	0.35	BC548B	0.06	BF871	0.41	BYW56	0.31	MPSA56	0.23	TA8220H	9.82	TDA4500	4.84	UPC1378H	1.68
2SC2236	0.36	7912	0.35	BC548C	0.09	BF959	0.18	BYW95C	0.21	MPSA92	0.18	TA8221H	7.26	TDA4501H	5.95	UPC1394C	1.92
2SC2240	0.21	7915	0.82	BC549B	0.11	BF960	0.30	BYW96E	0.48	NE555	1.03	TA8403K	2.31	TDA4502A	5.47	UPC1488H	2.99
2SC2271	0.67	AC127	0.52	BC550C	0.09	BF961	0.26	BYX10	0.30	NE592N	1.91	TAA550B	0.26	TDA4503	4.88	UPC574J	0.86
2SC2274	0.35	AC187K	0.59	BC556A	0.11	BFR90A	0.68	BYX55600	0.23	P6KE130A	2.55	TBA120S	0.89	TDA4505E	7.35	UPD1937C	3.85
2SC2314	0.38	AC188K	0.71	BC557	0.09	BFR91	0.60	BZV10	1.34	P6KE180A	4.65	TBA120T	0.51	TDA4505M	8.97	VID1054	0.60
2SC2335	1.12	AD149	0.52	BC557B	0.06	BR100	0.18	CA3189E	3.12	R2M	0.84	TBA810S	0.66	TDA4600	2.14	X2402P	3.75
2SC2482	0.35	AF127	1.51	BC557C	0.14	BR103	0.62	CD4001	0.24	R4050	3.04	TBA820M	0.24	TDA4600/2/3	2.82	ZTK33B	0.12
								CD4011	0.38								

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A look at the Panasonic Z5

In the second article in his latest series Ray Meadows describes the signal processing arrangements used in this small-screen chassis

This month we will deal with the signals circuitry used in the Z5 chassis and the optional teletext module. The obvious place to start is with the tuner unit and the IF section.

Tuner and IF

Unlike its predecessor, the Z5 chassis uses frequency-synthesised tuning. This is normally a more costly option than the alternative, voltage-synthesised tuning, but it does provide more accurate tuning, particularly where many broadcasts are packed into adjacent channels. On a recent trip to Belgium I found that some block-converted UHF channels shrink when down-converted for cable system use at VHF, with the result that they become less than the standard 8MHz bandwidth. This means that it is possible to squeeze more channels into the same space. In this particular case there were actually two channels corresponding to channel E12, one at the low end and the other at the high end. The latter was found only whilst search tuning. But I digress.

The tuner fitted in UK Z5 models is an Ecom type ENV87877G3, which is connected to the 30V tuning supply as well as the 12V and 5V lines and is thus powered down during standby. Tuning is controlled by the main micro chip IC1202, via an I2C bus – see Fig. 1. The tuner provides an unbalanced IF output which is passed to the SAW filter X101. Continental models that have a balanced-output tuner incorporate an additional buffer circuit, formed around Q101, to drive the SAW filter. The signal then passes to a Philips TDA8361 chip, IC601, which handles all the vision and sound IF, the sync, the colour decoder and timebase generator functions.

As far as the vision signal is concerned, IC601 contains an IF amplifier and demodulator, with full AFC and AGC

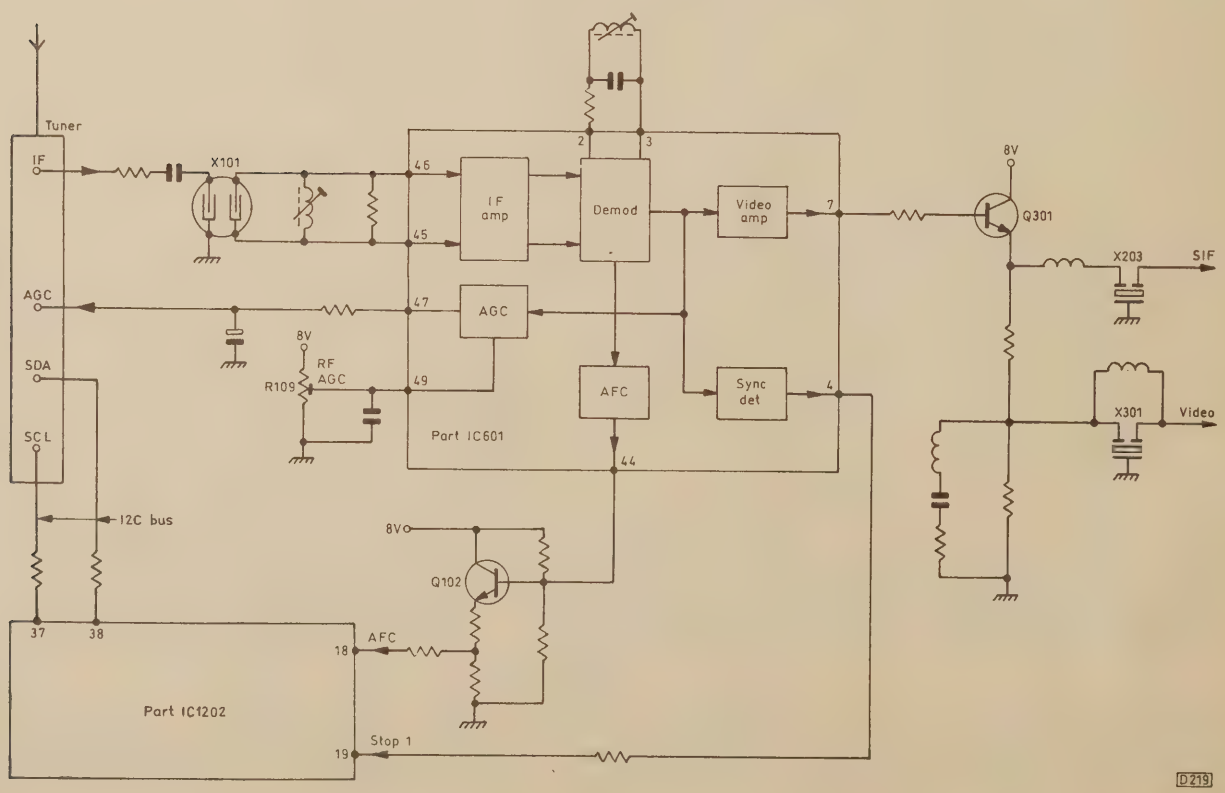

Fig. 1: Simplified block diagram/circuit, showing the arrangement of the VIF section of the receiver.

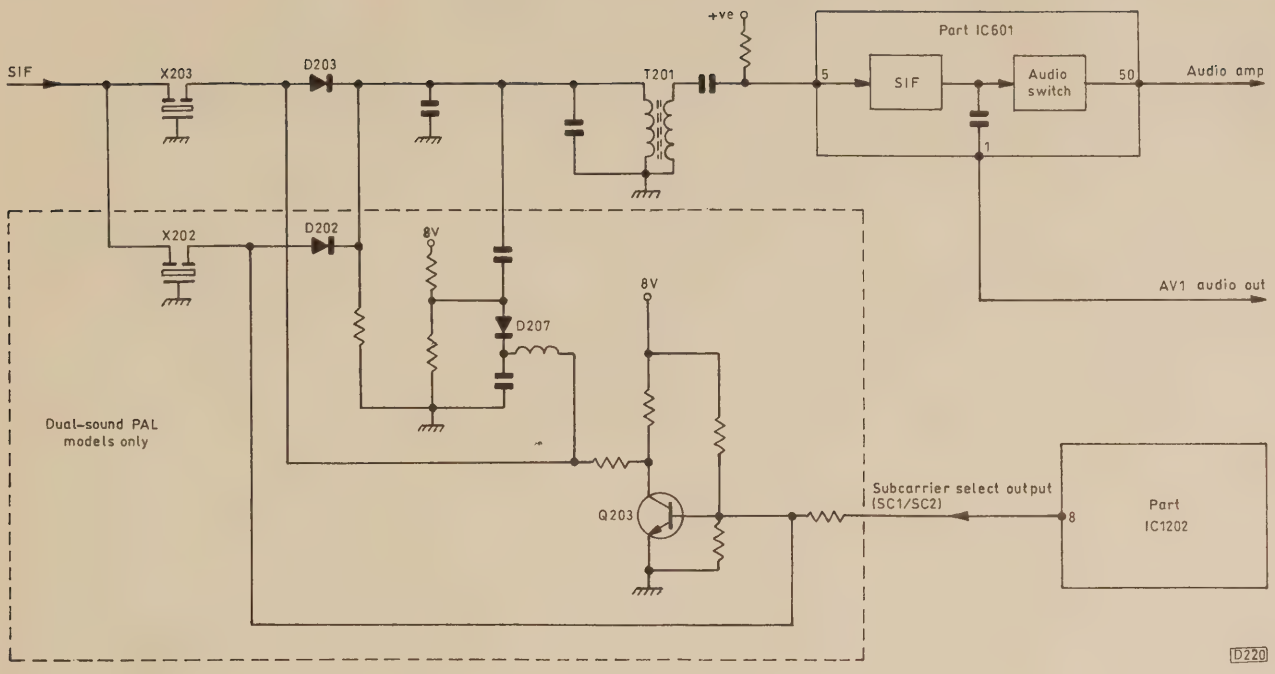

Fig. 2: The SIF system, including the modified arrangement for dual-sound PAL operation. For PAL I X203 has a centre frequency of 6MHz; for PAL B/G and D/K X203 has a centre frequency of 5·5MHz and X202 a centre frequency of 6·5MHz.

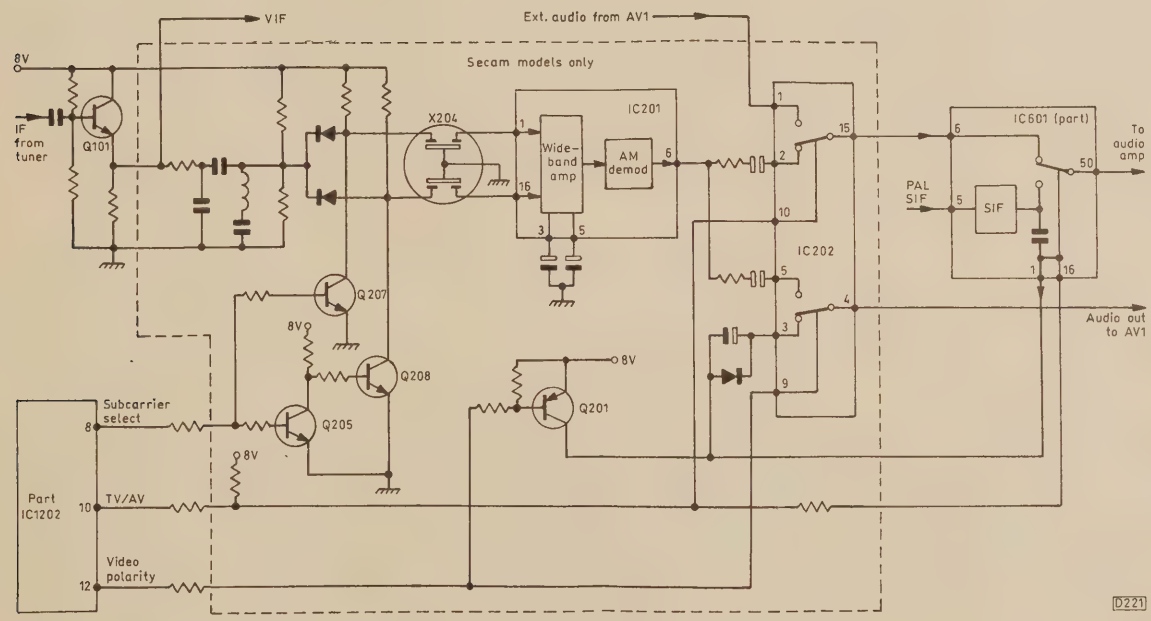

Fig. 3: The Secam sound IF/audio arrangement.

functions. The RF AGC output is fed direct to the tuner, while the AFC output is fed via buffer transistor Q102 to pin 18 of the microcontroller chip where it is interpreted, coded and sent to the tuner via the I2C bus to adjust the tuning. IC601 is not itself connected to the I2C bus.

The output from the demodulator within IC601 is fed to a video amplifier, to the AGC circuit and to a sync detector circuit. The latter provides an output at pin 4, which is connected to pin 19 of the microcontroller chip. When this pin is low, the micro knows that there is no IF signal present. It therefore mutes the sound via the PWM volume control output. The input at pin 19 of IC1202 is also used in the search tuning mode: the search continues until pin 19 goes high.

IC601's video output (with sound) leaves at pin 7, passing to the emitter-follower transistor Q301. From this point the signal is split. Ceramic filter X301 in the composite video signal path removes the sound signal. The

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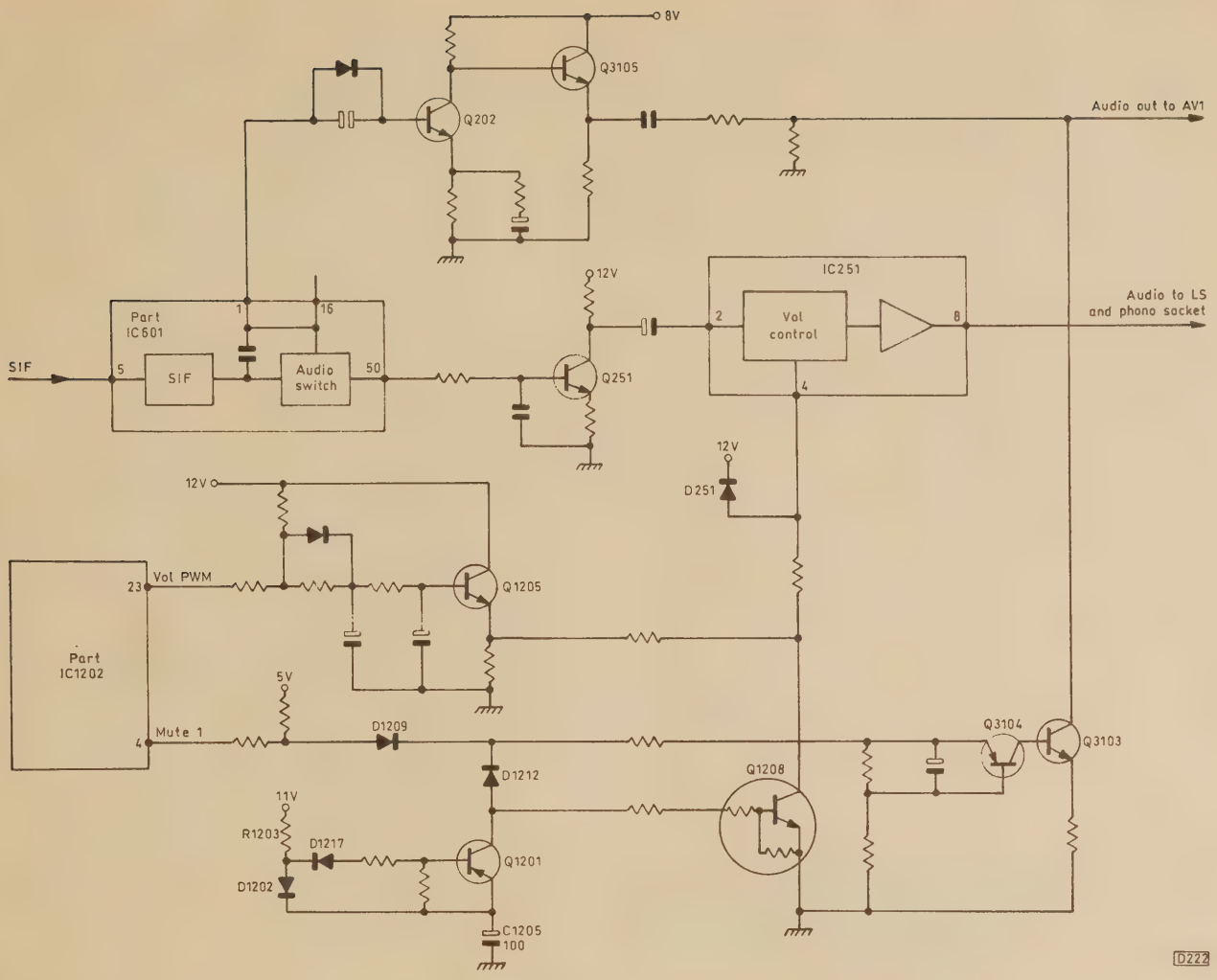

Fig. 4: The audio amplifier and mute system.

video is then passed back to IC601 (non-text models) or to panel T (text models – see Fig. 6 last month). There is also a recording output to the scart socket.

Sound IF

The path to the sound IF circuit, which is also in IC601, starts with the bandpass filter X203 (see Fig. 2). This passes the 6MHz signal to coil T201, which in turn feeds pin 5 of IC601. In countries where both PAL B/G and PAL D/K signals can be received there are two bandpass filters in parallel, X202 and X203, to cater for the 5·5MHz and 6·5MHz sound carriers. The output from the appropriate filter is selected via a pin diode system which is controlled by the SC1/SC2 output from the micro chip (pin 8). IC601 produces an audio output at pin 50.

Secam Sound

Secam L/L′ models incorporate an additional SIF circuit to handle the AM sound, see Fig. 3. This is built on a small subpanel which is referred to as board A. There are two chips here, IC201 and IC202. The AM demodulator chip IC201 is a Philips TDA3843. A 'quasi-parallel' sound demodulation system is used, the output from the emitter of Q101 being taken to a dual-frequency SAWF, X204, which can pass the 32·4MHz and 40·7MHz Secam L and L′ carriers. Note that with Secam L (Band III) the sound carrier is below the vision carrier whereas with Secam L′ (Band I) it is above the vision carrier.

Once again pin diodes are used for signal selection, under the control of transistors Q205/7/8. As the sound mode depends on the Band, the VHF low/other switch signal at pin 8 of IC1202 is used to control these transistors. After demodulation the audio signal is passed to the CMOS chip IC202 which contains two switches. The first selects an input from either the AV1 connector or IC201 to pass to IC601. The second selects either demodulated PAL or Secam sound to pass to the AV output. Fortunately this complication does not apply to sets from Panasonic UK.

Audio Circuitry

The selected audio from IC601 is amplified by Q251 (see Fig. 4) and is then fed to the Matsushita AN5265 audio amplifier chip IC251. This is the same device that was used in the Z4 chassis. Thanks to the simpler speaker cabinet design, it produces a cleaner, resonance-free sound with the Z5.

There are no tone controls. Volume is controlled via pin 4, using the PWM output at pin 23 of IC1202 after filtering, with Q1205 acting as a buffer.

The power-off mute circuit is also connected to this pin. The circuit uses transistors Q1201 and Q1208 and diodes D1202, D1212 and D1217. With the set in normal

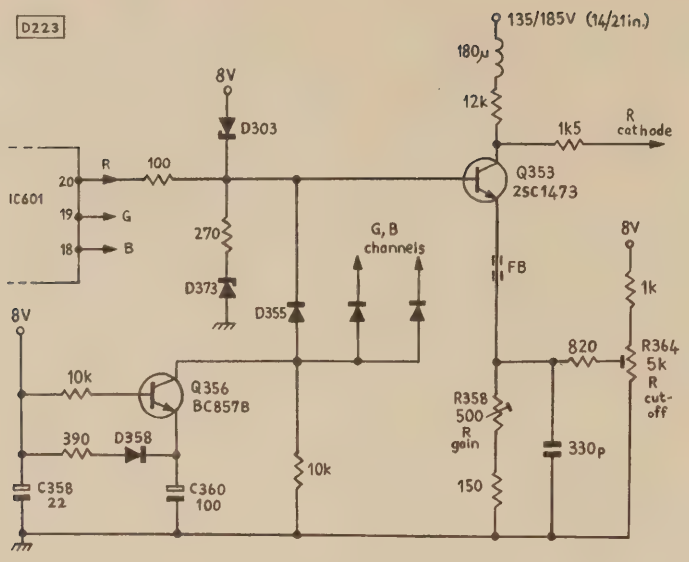

Fig. 5: One of the RGB output stage circuits (red).

operation, C1205 is charged via R1203 and D1202 from the 11V +B4 supply. At switch off, because of the charge stored by C1205 (D1202 will now be reverse biased) the voltage at the emitter of Q1201 will be higher than the voltage at its base. Thus Q1201 and Q1208 conduct, linking the volume control line to chassis. D1217 provides a path through which C1205 can discharge, so that the mute is removed should the set be switched on again quickly.

D1212 connects the power-off mute to the AV output mute circuit formed by Q3104 and Q3103. Thus the scart audio output is linked to chassis at power off. This circuit also receives a mute output from pin 4 of IC1202 to mute the scart audio during channel change.

The audio output from IC251 is at pin 8, where it goes to the headphone socket and loudspeaker. IC251 provides a 5W music power output.

Video Processing

Apart from the chroma delay line, which is a TDA4661V2 CCD chip (IC602), the colour decoder circuitry is all within IC601. Colour decoding follows standard practice, but there are several points of interest. The luminance delay line is built into IC601. It's followed by a peaking circuit, which provides – under the control of the main micro (at pin 14 of IC601) – sharpness adjustment. The resultant processed luminance signal is then fed to the RGB matrix.

The colour-difference signal outputs from the chroma delay line are fed to the matrix at pins 28 (B – Y) and 29 (R – Y). To cater for Secam signals, some models incorporate a Philips TDA8395 Secam decoder chip (IC603). This takes a filtered chroma output from pin 27

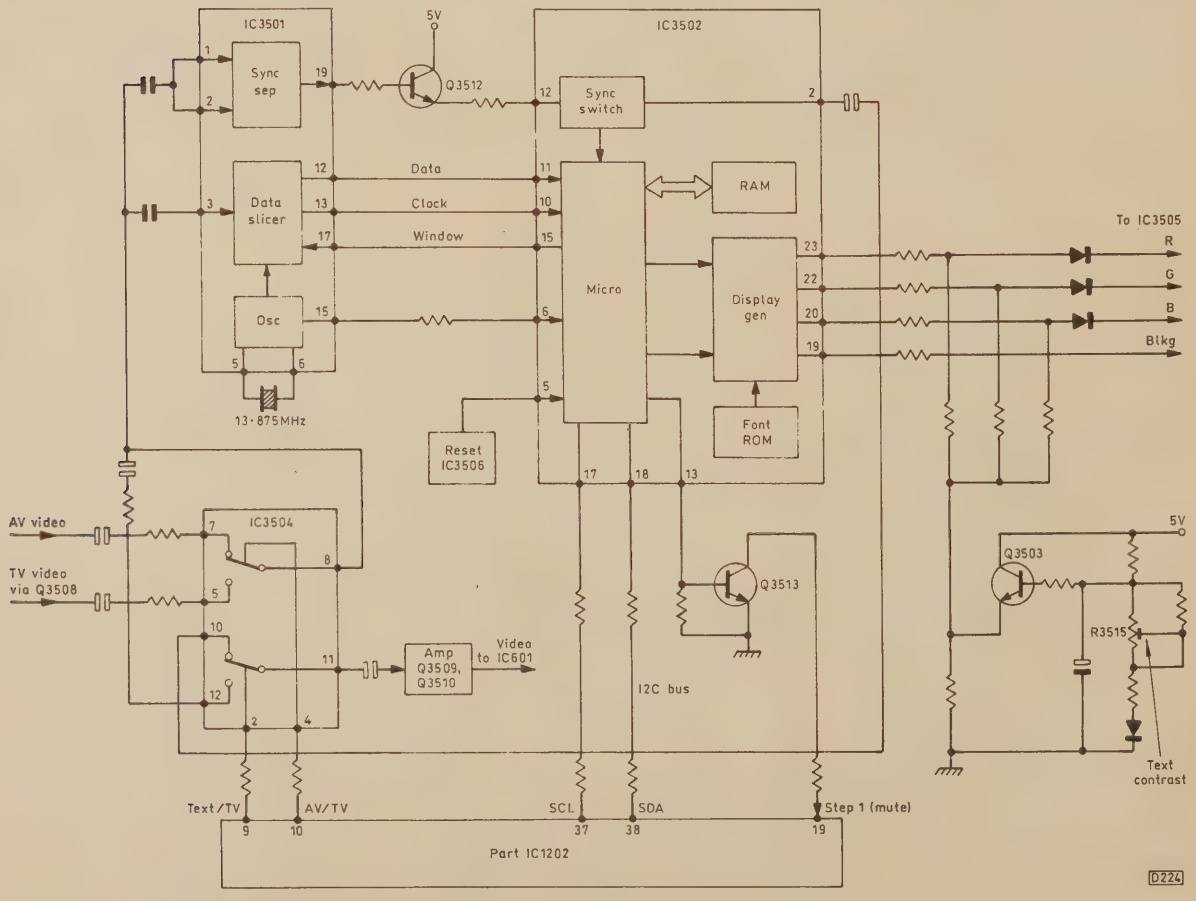

Fig. 6: Block diagram showing the arrangement of the Unitext circuit on panel T.

of IC601 and produces its own colour-difference signal outputs which, as with the demodulated PAL signals, are fed to the chroma delay line chip. In both the PAL and Secam modes the chroma reference oscillator is in IC601: there are separate crystals, connected to pins 34 (Secam) and 35 (PAL).

An RGB switch within IC601 selects the outputs from the matrix or external RGB inputs from either the scart socket or the teletext circuit.

The RGB outputs from IC601 leave at pins 20, 19 and 18 respectively. They are fed to the CRT base panel Y on which the output stages are mounted.

RGB Output Stages

As in previous Panasonic chassis, simple class A video amplifier design is used in the RGB output stages. Fig. 5 shows the red channel circuit. The RGB drive signals are fed to three voltage amplifier transistors, Q351, Q352 and Q353 (red). A potentiometer in the emitter circuit of each of these transistors is connected between the 8V line and chassis to adjust the bias: these are the cut-off controls. The red and green channels also include a gain adjustment potentiometer.

The collector of each output transistor is connected via a 12kΩ load resistor and a peaking coil to the 135V (14in. models) or 185V (21in. models) line. Cut-off and white balance adjustment are as described for the Alpha 3 chassis in the May 1994 issue of *Television* (see page 482).

Switch-off Spot Suppression

Switch-off spot suppression is provided by Q356 and its associated components. While the set is running C360 is charged from the 8V supply with the result that the base and emitter of Q356 are at the same potential. At switch off the 8V supply falls rapidly and the voltage at the emitter of Q356 becomes greater than that at its base. As a result it conducts, removing the drive to the RGB output transistors.

Teletext

The Z5 chassis uses a completely new solution compared to previous Panasonic chassis, the Texas Instruments' Unitext system. This has the advantage of providing most European language character sets via a single processor chip. Other languages, including non-Arabic fonts, are available with alternative versions of the chip. In addition, on-board memory means that four pages of text can be stored by the chip without the need for an external static RAM. The system also provides full level one features (FLOP) and TOP text, which is seen in the UK via German satellite TV channels, and a 'list' (no magazine) mode.

The main items in the circuit (see Fig. 6) are the CF72306 data slicer IC3501 and the Unitext processor IC3502, which is type CF70204ANW for UK models. They are on panel T, along with the video switch IC3504 and the RGB switch IC3505 (see Figs. 5 and 6 last month).

The video signal from the tuner or the AV connector is selected by IC3504 and fed to the data slicer chip IC3501, which strips off the text data and clock signals and also produces a composite sync signal. An on-board 13·875MHz oscillator produces a x2 data clock signal which is used to synchronise the outputs to the Unitext processor IC3502. The micro in IC3502 then decodes the text data stream, producing the required text pages in RAM. The page numbers are selected by remote control via the main microcontroller IC1202 and the I2C bus. To assist with text data acquisition, the Unitext chip counts the video lines from the sync signal and generates a 'window' gating pulse during video lines 2-22 for use by the data slicer.

When IC1202 selects the text mode, IC3504 is set to select the text-originated sync pulses instead of video. If the video signal should be lost or the text data level falls below a certain threshold, the Unitext chip decides that the video signal is poor and produces a mute signal output at pin 13. This, via Q3513, is connected to the Stop 1 pin of IC1202, which then produces a mute signal. It also means that the text display remains stable until a good video signal arrives.

The RGB outputs leave IC3502 at pins 23, 22 and 20 respectively, passing to the RGB switch described last month (see Fig. 5, page 739). The text blanking signal is used to control the switching action, mixing the text-originated RGB with any external RGB from connector AV1.

Other items in the text module include an MN1280R reset generator (IC3506), which is connected to the 5V line and IC3502, and an LM78M05 regulator (IC3503) which receives its input from the 16V line.

Text contrast control is via Q3503, whose conduction is controlled by the text contrast potentiometer R3515. This circuit is connected to each RGB channel via separate diodes.

Next Month

In the concluding instalment next month we'll look at the timebase circuits, including the 'hot' line scan circuit.

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Get a Life!

We all know what our Donald is really like – kind, patient, courteous etc., etc. Daughter Rebecca Bullock has hijacked his wordprocessor to fill us in on the etcetras. . . . . .

Hello! I'm Rebecca Bullock. My dad repairs TV sets and things and writes about some of them. He's a good dad, but when customers annoy him he kicks at our dogs and cat and walks over them saying "out of my way". He also gets nasty with my mum, and she says things to him that make him even more annoyed. Right now he's very annoyed, and my mum said I should write an article telling you what he's really like. I slipped into his hut to write this one.

Likes

I like my dad, even when he's annoyed, but he doesn't seem to like people. Well, he likes some. He likes my Aunt Lillie, but not my Uncle Tom, who works at the Weights and Measures and says he's important. My dad says he's unemployed and a prat and ought to be hung.

He doesn't like Mrs Brown. She brought along a plug and asked dad to fit it to her video lead. Then she came back and said he'd blown up her video. He told her to go to a place I mustn't say, and my mum told him to stop causing trouble.

Sundays

My dad likes to read the *Sunday Telegraph*. But when he opened it this morning the telephone kept ringing and apologetic people asked my mum which set is the best, and did my dad have a fuse, and was their set ready, and that their husbands thought it was a valve. My dad refused to speak to them and my mum put the phone on the table and hissed at him to grow up fast.

He always does what she says, because she's always right. So he talked to some of them. But meanwhile more apologetic people knocked on the door and came round the back, and crouched and smiled and waved at him through the window when we were having our dinner. They told him their set still wasn't quite right, and could he sell them a plug, and tune in their new video from Crubbs Foodstore, and stop their's rolling because they were expecting visitors. He got annoyed and told them to go to the place I mustn't say.

Then he caused trouble with my mum and said she was like my gran, only worse. He asked my mum to buy him a spade and some cheap crocodiles, but I don't know why.

It takes all sorts

Garth Palmer's mother is nice. Garth takes her radios and hair-dryers to pieces, then she brings them here and my dad throws them away for her and she gives him money. My dad likes Mrs Palmer and my mum thinks he's good at being funny.

My brother Jamie asked dad why his hair is going rotten and my mum said it's because he's old. But my dad said it's because my mum nags him. He said his hair was all right before he met her, and that he was four inches taller. The chemist down the road thinks he's old too. He thinks dad is my grampie. My dad said that the chemist is a prat and can go to that certain place as well if he likes.

Herbie Millar knocked his mother's radio over at Easter and my dad had to send off for a new cabinet. Mrs Millar and Herbie came to collect it yesterday. She said a new radio would have been cheaper, but my dad said she asked for a cabinet not a new radio and he wished he lived on the moon. Mrs Millar smiled and asked him to knock up a rocket. Then her Herbie started jumping about, making noises and saying he was a rocket. When she asked him to stop he screamed at his mother and knocked the radio on to the floor and the cabinet broke again.

Mrs Millar told Herbie he'd been very naughty and started to cry. But Herbie stamped his feet and screamed and wouldn't be quiet. Then my dad came over from the bench and smiled at him and whispered in his ear. He shut up at once. I heard what my dad said, but I don't think his soldering iron would have fitted and anyway it was very hot. Mrs Millar dried her eyes and said how good my dad is with children, and how lucky my mum is.

Outside calls

My dad doesn't like calling at people's houses, but a man who wore a round hat and a frock sat in the workshop and talked quietly to him for two hours and said his set hadn't been right since dad had done it. In the end my dad agreed to go and took me along.

The man ran along the pavement behind our van and was puffing when he caught us up at his house. He unlocked the door and my dad went in and walked quickly round the table and out again. The man watched us drive away. When I asked my dad why he came out so fast he just said "stunk". He told my mum that the set had a Snoddies sticker and that the man could go to the place I mustn't say.

Holidays

When we go on holiday my dad is really happy and my mum likes him a lot. We don't tell anyone that my dad mends sets because if we do they all tell him what sort of set they've got and what was on when it went wrong and how the man

they called was a crook and it was only a loose wire. This sort of thing makes my dad nasty and he rows with my mum. She tells him to get that look off his face and he tells her she should have had a husband who clouted her. She jabs him and says nobody would clout her and his side of the family are all mental.

My dad likes listening to BBC radio programmes. When we go to Spain he picks them up on our satellite dish and transmits them around our house and garden using a little home-made transmitter. My mum can hear them on her VHF radio while she's ironing on our sun roof or in the garden.

Not long ago dad mended our neighbour's radio. The neighbour called him over the garden wall, gave him two bottles of wine and said he was the best engineer there ever was, because his set now even picks up Radio 2 "all the way from Britain".

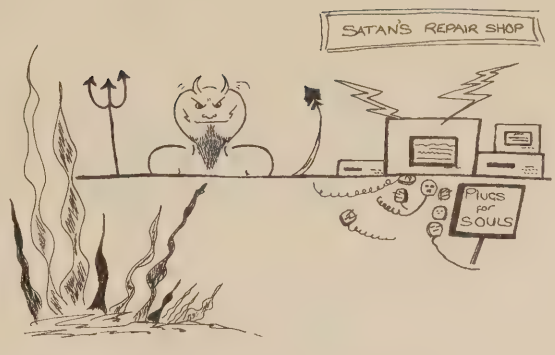
Last night we went to Paco's to have a meal. The TV set there kept going to a line. Paco started looking at my dad so we left and went to Manuel's. Half way through our dinner a bullfight came on and the set banged and smoked and my dad said "bloody good job". He said he hoped the bullfighter had blown up too. He wished every set in Spain would blow up and that all the so-called engineers would go to the special place and stay there for keeps. He said next time we go to Spain he's going to take with him a special remote control to switch off all the sets everywhere he goes.

At home

Our telly isn't on much when dad is at home, because the people on it annoy him and make him call my mum names. He says when he was a boy he never saw anyone like the people he sees every day on television – they were all in asylums or hung. He wants them hung now.

My dad wears sandals. He says it isn't because he cares about the world and that those who do are prats. He likes a laugh though. Once when I was with him at Mrs Blair's house he purposely told her a lie. When she made a joke about his toe poking through his sock he said "I know, but it's the only pair I've got". She took two pairs of socks off her clotheshorse and tossed them over to him. Her husband looked up from his paper and said "hey, hey there." But my dad kept the socks. They were good ones.

When my dad is out my mum says she doesn't know what she'd do without him. I like my dad. Even though he keeps telling people to go to the place I mustn't say.



"I wonder if this is going to be a god day for Donald, or am I going to be rushed off my feet". . .

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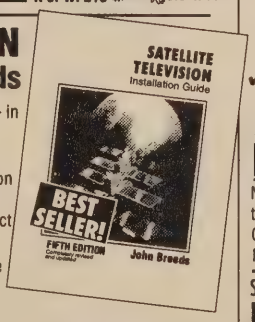

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Capacitance Tester/Comparator

This bridge circuit, devised by Ian Rees, provides a quick go/no-go check on high-value capacitors. It enables capacitor values to be compared and leakage detected

With the increased reliability of electronic equipment, it's becoming less and less possible to carry out servicing on a stock-fault basis. Nevertheless certain types of components, especially when used in particular ways, are responsible for a far greater percentage of faults than others. Of these, electrolytic capacitors are amongst the least reliable items used in electronic equipment. When mounted in a position where they are subjected to heat they tend to dry out and fall in value, or develop electrical leakage. When faulty they are often responsible for the failure of other components, which they can take out domino style.

Preventive maintenance carried out by blanket component replacement can be cost effective in the short term, but won't tell you much about the true situation in a particular piece of equipment. A little more time spent checking each component as it is removed will reveal the actual condition of an ageing chassis. As experience is gained in this way, so time can be saved and the cost of replacement components reduced.

My all-singing digital multimeter will check capacitors with values up to 20µF. So anything above 20µF had either to be replaced without question or checked using the swing time of the needle of my analogue ohmmeter. Comparing this with the result obtained with a new capacitor produced a ball-park charge estimate, which is by no means an accurate method. The capacitance comparator described in this article was devised to overcome this problem. It's very useful for quick go/no-go checks on high-value capacitors to establish their condition.

Circuit Description

Fig. 1 shows the basic circuit, simplified to make its operation clear. The two electrolytic capacitors Cx and Cr are connected as two elements in a DC bridge circuit. At the moment when voltage is applied to them, they charge exponentially via the equal-value resistors R1 and R2. When the value of the two capacitors is the same, they will charge together at the same rate and the centre-zero meter's pointer will not be deflected.

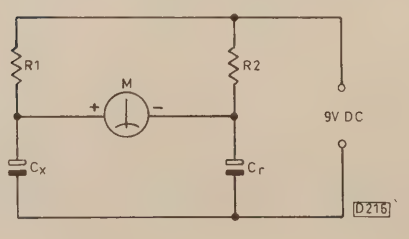

Fig. 1: Basic principle of the capacitance comparator bridge.

If Cx is of lower value than Cr, Cr will take longer to charge and a lower voltage will be present across it than across Cx during the latter part of the charging cycle. As a result the meter's pointer will be deflected. If Cx is of larger value than Cr the meter deflection will be reversed. When the two capacitors have both charged fully the meter reading will return to zero. If the meter shows a standing deflection after this, it will be caused by leakage in one of the capacitors.

This is the basic principle of the comparator. Fig. 2 shows the circuit of the working prototype.

It is important that both capacitors are fully discharged before the test is started. The three-position function switch S1A/B enables the capacitors to be discharged, via R5, when in position D (discharge). Do this before and after the test. Comparison for value, as just described, is carried out with the switch in position C (compare). Leakage is indicated with the switch in position L – in this position the reference capacitor is open-circuited.

The centre-zero meter M, used to provide the indication, is protected by the back-to-back zener diodes D1 and D2 and resistors R3 and R4. This is essential to prevent it being damaged by a short-circuit capacitor or test leads.

Construction

There are so few components that the prototype doesn't even have a PCB. Point-to-point wiring is suitable and, with a little thought, the unused tags of the function switch S1 can be used as anchor points.

A plastic box from CPC was used to house the unit, padded inside to hold the PP3 battery in place. The function switch, a three-pole, four-way type, was also obtained from CPC. Its stop was altered to give just three ways.

To keep it simple, I rely on my supply of spares instead of using switched capacitors as a reference. Two pairs of crocodile clips, correctly colour-coded for the +/– connections, are connected to leads that exit from the top and bottom of the box. These pairs are labelled test and reference to ensure that I have the correct capacitor connected to the relevant leads.

In practice I use the component I'm about to fit as the

reference. But the shelf life of electrolytic capacitors is often unstated. So even a new component could be of uncertain condition. Doing things this way means that the replacement capacitor can also be checked before it's fitted. On several occasions I've found that the replacement has been faulty. This could have caused a lot of grief had it been fitted.

For logical reasons it's sensible to ensure that the meter's pointer swings right (+ve indication) when the reference capacitor has a larger value than the one being tested. This can easily be checked by shorting together the reference terminals with the function switch set to position C.

The value of R1 and R2 was chosen to provide the greatest range from 1µF upwards. If you want to speed up the test with capacitors of 1,000µF and above, the value of R1 and R2 can be reduced to 1kΩ or less. Unfortunately with this resistance value smaller value capacitors will not be able to produce a visible meter kick.

Use

The tester draws only a small current from the 9V PP3 battery during a test. Provided the unit is left switched to position D (discharge), it is effectively off. This is the start position for all tests, and ensures that both capacitors are discharged.

The comparator will work with capacitors of 1µF value upwards. Do not use it with capacitors whose working voltage rating is less than 9V. Bear in mind that high working voltage capacitors will have higher leakage currents than will be shown by a 9V instrument.

Smaller-value capacitors give a 20-30µA kick that's instantly seen. With large values of 1,000µF and above a few seconds are required for the charge to start to bottom out before the meter deflects to show the comparative charge rates of the capacitors.

Non-electrolytic capacitors charge very rapidly and decay to zero with no leakage.

Electrolytics can be seen to form as they charge. For this reason, compare like with like when testing. Avoid mixing types, otherwise confusing results will be obtained.

The test procedure is as follows:

(1) Set the function switch to position D.

(2) Connect the new capacitor to the reference terminals, with correct polarity.

(3) Connect the capacitor being checked to the test terminals.

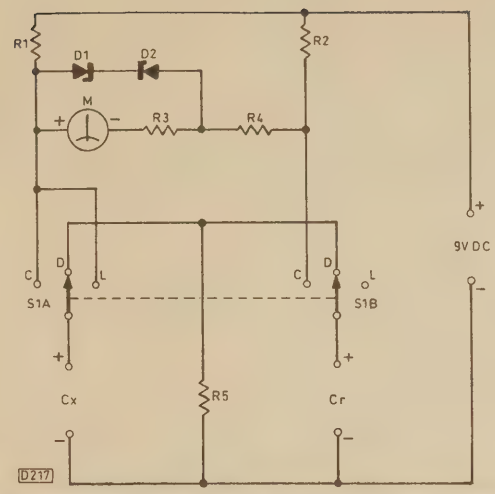

Fig. 2: Circuit of the prototype capacitance tester/comparator. Meter polarity shown for connections, not panel indication.

Component details

R1, R2	4·7kΩ, 0·25W 5% carbon
R3	33kΩ, 0·25W 5% carbon
R4	2·2kΩ, 0·25W 5% carbon
R5	100Ω, 0·25W 5% carbon
D1, D2	BZY88C 3V6 zener diodes
M	100-0-100µA moving-coil meter MPS/Maplin RW98G)
S1	3-pole, 4-way rotary switch (CPC ALF441C)

PP3 battery, battery connector, box, knob, four crocodile clips

(4) Set the function switch to position C. Watch whether the meter's pointer moves in either the +ve or the –ve direction, indicating that the test capacitor Cx is of smaller or larger value respectively than the reference capacitor Cr.

(5) Set the function switch to D then to L. The meter will deflect then fall back to zero. Any subsequent deviation is caused by leakage. Most capacitors show little or no leakage when fully charged.

(6) Always return the function switch to position D when the test has been completed. ■

Answer to Test Case 405

– See page 785 –

Well, what can be wrong with a satellite installation when the dish is correctly aligned, the LNB is a known good one and the receeiver has been found to be OK by substitution? The feeder cable of course! It's a misleading situation, especially when, as here, only one channel or a group of channels is affected. You expect a cable either to work or not work. And if it has become lossy for any reason you might (naively!) expect that the loss would increase with frequency. Not necessarily, in the realm of domestic satellite reception. Damage, joints, tight bends, physical constriction of the cable, bad termination and water can all cause strange symptoms.

In this particular case it seemed that cable ageing was the sole cause of the trouble – it wasn't very good quality cable anyway, from the look of it. Certainly a new run of good-quality, double-screened satellite cable cured the problem, restoring interference-free reception of all the available channels.

Meanwhile Mr Todd, impressed by the loan receiver in spite of the short time it had been there, bought a posh new Grundig IRD and consigned the old one, complete with its descrambler box, to the dustbin where the lossy cable had gone. All that remains of the original installation is the dish, which is gently rusting in the summer sunshine.

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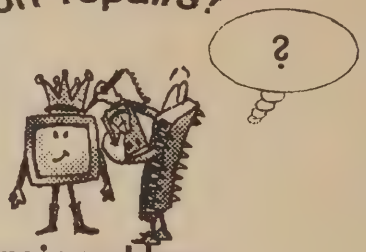

Repair problems

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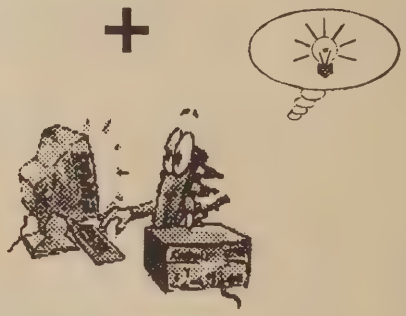

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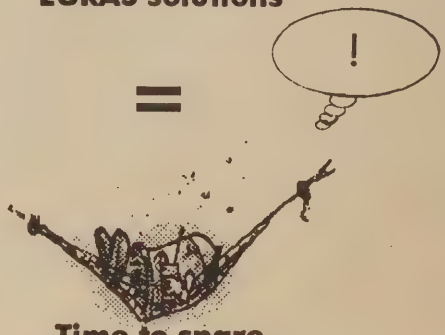

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Time-lapse VCRs

How time-lapse VCRs differ from conventional ones. Features of time-lapse machines. Servicing aspects. Joe Cieszynski on a good prospect for increasing the scope of your servicing activites

In recent years there has been a steady increase in the number of time-lapse VCRs used in the video surveillance industry. This growth is expected to continue, as the cost of video surveillance equipment falls and the police, insurance companies and private security firms demand video surveillance to complement intruder alarm systems.

Not surprisingly the VHS format dominates the field, mainly because of its low cost. In earlier years manufacturers simply adapted their consumer designs to meet the requirements of surveillance work. This is less often the case today, as the average domestic VCR would not withstand the punishment a time-lapse machine receives. The time-lapse VCR must be capable of providing peak performance over a prolonged period.

S-VHS quickly found a role in this market. Its higher performance was immediately appreciated by the industry, while the higher cost didn't prove to be the drawback it has been in the consumer market.

A point that should be of interest to readers is that these machines represent a new source of servicing work – along with the monitors, cameras and controllers that go with them. Most engineers who install and maintain surveillance equipment do not have an electronics background, and are not expected to open up any of the equipment when it fails. Faulty equipment is replaced and taken back to base, where it is frequently sent out for servicing. The average workshop that's equipped for VCR and camcorder repairs is in an ideal position to be able to take on surveillance equipment servicing.

What then is a time-lapse VCR, and how does it differ from a domestic machine?

Time-lapse Operation

The need for time-lapse operation in the surveillance field is pretty obvious. No matter to what extent any of the current VCR formats are modified, they will never provide more than a few hours of continuous recording. This is totally inadequate where the requirement may be to record events for twenty-four hours a day, seven days a week. With time-lapse operation, large quantites of still pictures are recorded at short time intervals, thus making it possible to record sufficient information to provide a continuous 24-hour record service. A full E180 cassette recorded in the time-lapse mode can be likened to a photograph album that contains 270,000 pictures!

A number of developments in recent years have improved the performance of time-lapse VCRs way beyond what was earlier expected of them. But before we look at more modern format machines, we should consider the basic principle of time-lapse operation.

The time-lapse VCR makes maximum use of the still-frame feature and the precision of a Hall-effect motor. For time-lapse operation the basic sequence is to lace up, run the drum up to speed, start the tape transport, record one frame (two fields), stop the tape transport, pause for a given length of time and so on.

While the tape is running, it moves at the normal speed of 24mm/sec. It's the pause intervals between recorded frames that provide the extended recording time. The need for a very high-precision servo control system and capstan motor is clear when you consider that the tape speed has to accelerate to 24mm/sec and subsequently decelerate to stop almost instantaneously.

Fig. 1 illustrates the time-lapse track format. The numbers at the top represent TV frames. In this example I've assumed that the machine is operating in the twelve-hour time-lapse mode. The machine records one complete two-field frame while the tape is being driven at 24mm/sec, then the drive is halted for nine frames, after which the tenth frame along is recorded. Thus one frame in every ten is recorded, the cycle taking 0·2sec (ten 20msec frames = 0·2sec). The drum continues to rotate while the tape is stopped, but the output from the heads is switched off so that it doesn't override the tracks just recorded.

The recording time in the twelve-hour mode requires a bit of explanation, because it is not actually twelve hours. An E180 cassette provides a basic recording time of 180 x 60 = 10,800 seconds. The number TV frames recorded during this time is 10,800 x 25 = 270,000. With time-lapse operation this works out at 0·2sec x 270,000 = 54,000 secs, which is fifteen hours.

Similar calculations in the other time-lapse modes prove that the recording time available is always three hours more than the time suggested. If we consider the twelve-hour mode again, when the 0·2sec cycle is reduced by one 40msec frame period the recording time becomes twelve hours. But, as we shall see later, to maintain the VHS specification one frame more than the time-lapse period has to be recorded.

When the recording depicted in Fig. 1 is played back in the twelve-hour mode the machine operates in a continuous play, pause, play, pause fashion. As a result you can view the pictures in a real-time form with a duration of fifteen hours, though they are just a series of still frames. Alternatively the machine can be set to the three-hour mode, i.e. standard VHS operation, which enables the recording to be seen in fast motion. When a slower time-lapse is selected, the operator can examine each frame in greater detail.

The main drawback with time-lapse recording is that activity which occurs between the recorded fields is missed: the longer the time-lapse, the greater the amount of information lost.

Improved Technique

The time-lapse system just outlined was used with earlier machines. A number of manufacturers have introduced a refinement that goes some way towards reducing the information loss.

In the arrangement shown in Fig. 1, both fields of each selected frame are recorded. Although this gives good quality when the recording is played back at normal speed, when the tape is played back in the time-lapse mode the machine is effectively in perpetual still and the second field is not used – the two heads scan the same

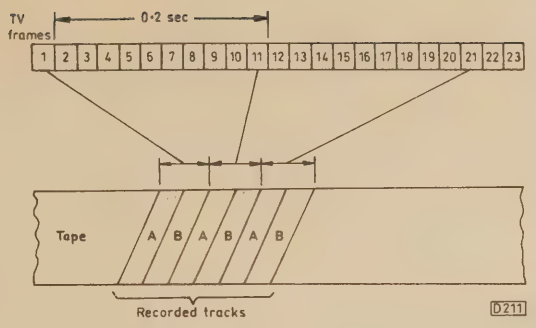

Fig. 1: Track arrangement with a frame-advance machine in the 'twelve-hour' time-lapse mode: every tenth frame is recorded.

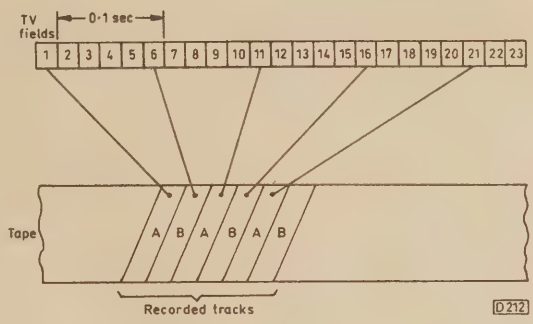

Fig. 2: Twelve-hour mode recording with a time-lapse cycle half that in Fig. 1: every fifth field is recorded.

section of the video track. This being so, why not record one field per frame and use the second field for another recording later on? The principle is outlined in Fig. 2.

Note that the figures at the top this time represent fields rather than frames. Although the machine still operates in the twelve-hour mode, the time lapse cycle has been reduced from 0·2sec to 0·1sec. During each pull however the tape moves for 20msec instead of 40msec (one frame). The tape will still run for fifteen hours, but will have recorded twice as much information – 2 x 270,000 = 540,000 still fields.

Fig. 3 demonstrates the advantage of recording in this manner. Consider the sequence of events being recorded by a time-lapse machine recording complete frames in a 360-hour mode with delay cycles of 4·8sec. If the machine recorded picture one, the next to be recorded would be picture six. The action has not been caught. Now consider the same sequence with a machine that records fields. In the 360-hour mode the delay cycle is now only 2·42sec. So if picture one is the first to be recorded, the next to be recorded will be pictures four then seven. Much more has been caught!

Delay Period

The delay period cannot be selected at random. It has to take two important factors into account.

First, because of the slant-azimuth technique used with VHS machines, the tracks must be laid down in the order ch. 1, ch. 2, ch. 1, ch. 2 etc. (or A B A B as some texts call

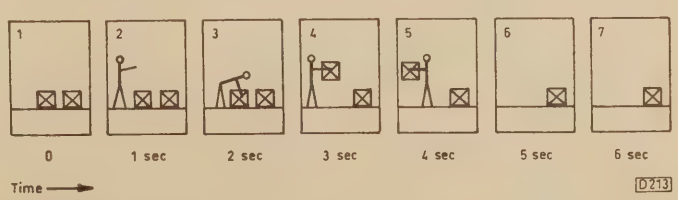

Fig. 3: Vital information can be lost when the time between recordings is lengthy.

Fig. 4: Phasor representation of the recorded ch. 2 VHS chroma signal that would produce a pure magenta raster.

it). The delay time has to ensure that when an odd field, which is recorded as a ch. 1 track, has been laid down the next field will be an even (ch. 2) field, and vice versa.

Secondly, the delay period has to take into account the chroma signal phase rotation used in the VHS system to cancel crosstalk. The ch. 2 chroma is phase retarded by 90° on each line prior to being recorded: subsequent phase shifting and comb filtering during playback result in chroma crosstalk cancellation.

The phase shifting follows a set sequence over four TV fields. This is illustrated in Fig. 4, where the arrows represent the ch. 2 chroma signal's phase on each line after the 90° phase retard. The diagram assumes that a pure magenta raster is being recorded.

Those wishing to look into this subject in greater detail should refer to my articles in the February-April 1996 issues of *Television* (in the VCR Signal Processing series).

For the crosstalk cancellation system to work with a time-lapse VCR, the recorded pattern must follow the basic four-field sequence. This means that in the twelve-hour mode each fifth field has to be recorded. If, for example, the first field A in Fig. 4 has just been laid down on the tape, the next field that can be recorded is the next-but-one B field. This will be followed by the next-but-one C field etc.

This might be more clearly explained as follows. Take the following series of fields in the twelve-hour mode:

A B C D A **B** C D A B **C** D A B C **D** A B C D A B C D A **B** C D

Recording each fifth field, shown in bold, maintains the format. The delay cycle is 100msec (five fields). In the 24-hour the situation is as follows:

A B C D A B C D A **B** C D A B C D A B **C** D A B C D A B C **D**

This time every nineth field must be recorded, the delay cycle being 180msec. This is why the actual recording time is always three hours longer than that implied by the mode selected. The delay cycles for all other time-lapse modes must also ensure that the four-field chroma signal phase is maintained.

Any attempt to play this tape back at normal speed (three-hours) will result not only in a very fast motion effect but also in picture distortion, because each interlaced field is from a different frame.

Remember also that when frame advance is selected the tape is moved by one instead of two tracks.

The accompanying table (below left) lists time-lapse modes and the associated delay cycles commonly used. It is not exhaustive.

A problem that manufacturers have to deal with is accelerating the tape speed to 24mm/sec in a very short time. In practice this cannot be achieved, the record speed being slightly less than 24mm/sec. Without compensation, the change would result in a shift in the angle at which the signal is laid down on the tape. The angle is very precisely set at 5·9° in the VHS system, and is determined by several factors that include the tape speed – a slight reducation in speed reduces the track angle slightly.

The problem is overcome by altering the drum speed while recording. The principle is simple: if a slower tape speed reduces the angle, a corresponding reduction in the drum speed will provide correction.

Mode	Running time	Delay Frame rec.	Delay Field rec.
12h	15h	0·2sec	0·1sec
24h	27h	0·36sec	0·18sec
48h	51h	0·68sec	0·34sec
72h	75h	1sec	0·5sec
120h	123h	1·64sec	0·82sec
240h	243h	3·24sec	1·62sec
480h	483h	6·44sec	3·22sec
720h	723h	9·64sec	4·82sec
960h	963h	12·84sec	6·42sec

Linear Slow Speed

A drawback we have not so far considered is loss of the sound recording facility: any attempt to record a linear sound track while the tape is moving in these short, intermittent bursts would produce unintelligible results.

Some machines offer time-lapse recording for up to twenty four hours with a continuous sound track. The tape is driven at a very slow speed, making it possible to lay down a sound track. But the slow speed means that the HF response is poor. Remember also that the extinction frequecy falls as the tape speed is reduced. There is also considerable wow and flutter.

There are different linear slow-speed modes, for example twelve and 24 hours, but the delay period is the same as for intermittent time-lapse operation. When the first field has been recorded, the video heads are switched off for the duration of the delay period. When the time comes to record the next field the tape, which has been running continuously, will be in the correct position in relation to the heads.

In the twelve-hour continuous mode the tape speed is 4·678mm/sec; in the 24-hour mode it's 2·599mm/sec (the standard speed is 23·39mm/sec).

The track format in the slow-speed mode is the same as that in the intermittent time-lapse mode, i.e. one field is recorded each time-lapse interval. The only benefit this mode provides is the facility for recording sound.

When sound is not required in the 12/24-hour modes it's best to select intermittent operation – the picture quality is better. In the linear slow-speed mode the video heads play back the same scan several times as the tape passes slowly. The result is a constantly varying signal-to-noise performance, as the head moves from the centre to one side of the track and back again. Some manufacturers attempt to overcome this problem by using all four video heads during playback. A sensing circuit in the FM stage detects which head is producing the highest FM output at any time, this output being selected as the playback signal.

Shot Mode

This is another feature offered by some manufacturers, provision being provided for an external trigger input. When the 'shot' mode is selected, the machine waits for a trigger pulse and then records a small number of frames or fields (depending on the recording format). Once about half a dozen frames/fields have been recorded the machine returns to the pause mode.

Because the machine cannot remain in the pause mode indefinitely – the tape would be worn out by the

continuous video head scanning – it records a few frames/fields every three or four minutes in the shot mode. This enables the tape to move slowly past the heads.

The shot input is usually a normally-open (N/O) one that's taken to ground for activation. The trigger switch may be a manually-activated N/O non-latching push switch, a pressure mat or even the bell output terminals of an alarm control panel with a negative applied bell trigger.

There are also passive infra-red detectors that are designed specifically to trigger a time-lapse VCR. To provide compatibility they offer selectable-polarity switch outputs.

Alarm Inputs

Like the shot feature, alarm recording is activated by an external trigger input. The alarm input enables more information to be recorded at the time of a possible intrusion by immediately placing the machine in the three-hour mode. If, for example, we look again at the theft in Fig. 3, if the intruder activated an alarm on penetrating the area the machine would go from the time-lapse mode to which it was set to the three-hour mode.

After a preset period, which may be selectable, the machine reverts to its previous mode. The running time of an alarm recording is usually at least one minute. It may be several minutes.

Some machines have a reset input that enables normal operation to be restored manually before the internal alarm timer has cut out. This is usually a N/O non-latching switch.

Alarm Input Markers

Many machines have an index search facility to provide quick access to alarm events during playback. A marker signal is recorded on the control track each time an alarm input is received. During fast wind or visual search, the machine can be programmed to stop at a particular alarm event and enter the play mode.

Many manufacturers make use of the VISS (Video Index Search System) which is widely used in consumer machines. The idea is to alter, for a period of four seconds, the mark-space ratio of the control pulses at the start of each alarm recording (see Fig. 5).

The control pulse mark-space ratio is normally 60:40. To generate the VISS signal, it's changed to about 27:73 for the four-second period. The tape will be unlaced from the video heads during rewind or fast wind: it will still be partially laced however, passing the audio/control head which can thus read the control track. The signal is passed to the microcontroller chip, which analyses its mark-space ratio. On detecting the 27:73 ratio the chip initiates the stop and, possibly, the play mode. The altered mark-space ratio does not affect the operation of the phase control servo, since this relies on the timing of the pulses rather than their duration.

Some manufacturers have introduced variations to the standard VIS system to improve the search capabilities of their time-lapse machines. The machine may be programmed to record a digital signal, containing a time code, in addition to the control pulses. The operator can key in a specific day and time: the machine will then fast wind until the required time is read off, using the control head for detection. When the required time is reached, the machine laces up fully and goes into the play mode.

The number of alarm events may be displayed on the monitor screen, along with a reference number. In addition the machine may have some form of indication on the front panel, or it may include an alarm output terminal to which a warning device such as a 12V buzzer or lamp can be attached. This output is usually a dry relay contact, so an external 12V supply needs to be used.

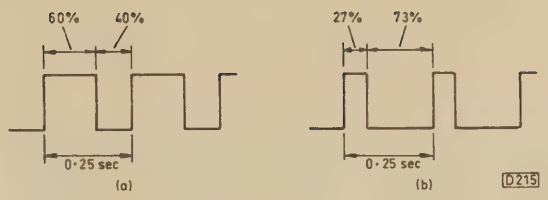

Fig. 5: Basic VHS control track pulses (a). Modification for VISS purposes (b).

Auto Re-record

The operation of this feature is very simple. When it's selected, the machine automatically rewinds at the end of the tape and starts to make a new recording.

Clock Output

The clock output is a very important signal. Up to now we've considered the time-lapse feature only in the context of a single camera input. What happens if there are a number of cameras, controlled by a separate switcher unit whose output is fed to the VCR? Unless the time-lapse and camera switching are synchronised, cameras may be missed out or may be switched in half way through a recorded field.

To overcome this problem, the time-lapse delay signal generated by the VCR is made available to serve as a camera controller sync output. This is fed to the controller's external sync input to override the switching signal generated by the controller.

Some machines have a built-in camera controller. The one disadvantage of this is that the built-in controller may not have the range of features required for a particular installation.

Servicing

It's very easy for those familiar with servicing domestic VCRs to become accustomed to time-lapse machines, since in most respects they are the same. The nature of the complaints you get may vary a little however. The customer is obviously going to be more particular about the performance of the still and frame advance functions, which are essential instead of being novelty features. In addition, main microcontroller problems often produce different symptoms because of their different programming. Although basic mechanism control is the same, domestic control systems relate mainly to timing and tuning. With a time-lapse machine the programming naturally relates more to the time-lapse modes, alarm inputs and outputs and, in more modern models, clear warning to the operator of any system faults.

The thing to bear in mind is that when a machine lands on your bench for repair it could well have been operating for twenty four hours a day for the last twelve months. So don't waste time looking for individual tape path faults. Every machine that comes in must be given a full mechanical overhaul before anything else is done. Then deal with any faults that remain.

Pay particular attention to the control head. Replace it if there are any signs of wear – on most machines it does far more than simply record and play back the control pulses. As we have seen, the control head often plays an important role in various search modes. And of course frame advance will suffer if the pulses are attenuated.

One of the more common symptoms is poor tracking in the time-lapse mode. This is simply because the frame (or field) advance isn't working as it should. In most cases cleaning and servicing the mechanism solves the problem. Pay particular attention to the brake pads or braking

mechanisms on the capstan flywheel, as these are vital to the frame advance operation. Since a time-lapse machine usually spends most of its working life stopping and starting, these items can wear.

If the machine still suffers from poor time-lapse mode tracking after a clean and service, check the condition of the capstan motor. Time-lapse operation has serious implications for this item. The constant kicking action to provide the precise tape movement places an immense strain on the motor, which requires high currents to provide the acceleration and braking action. The capstan motor will be a brushless Hall-effect type, which is far more robust than a simple brush/commutator type. Any mechanical wear will impede its operation however.

The test equipment required for time-lapse VCR servicing is basically the same as for any other machine, but you should have a pattern generator with S-VHS outputs.

There is a real bonus if you are tooled up for camcorder servicing, because you can offer a surveillance camera repair service. Many of the smaller cameras are considered to be throw-away devices however. There is a drawback in offering to service the full range of equipment: you may find that motorised camera housings are delivered to your workshop. These don't seem too large when you drive past them on the motorway. They take on an altogether different appearance when seen close up on the bench!

Test Tapes

Your alignment tapes or home-made colour-bar test tapes can be used for time-lapse servicing. You will find it helpful to make yourself a time-lapse test recording however. In particular you should have available a recording made on a field advance (rather than a frame advance) machine. Remember that in this mode each helical track on the tape is from a different frame, so a colour-bar recording made by a standard machine won't tell you whether the time-lapse machine is advancing just one field at a time or is slipping.

A collection of tapes with recordings made in different time-lapse modes is a very useful addition to your workshop, especially if they have been made using a camera trained on an area of activity, so that movement is clearly visible (this probably rules out the manager's office!).

Spares

As the majority of time-lapse machines are manufactured by companies that have been well known in the brown goods industry for years, spares are usually not too difficult to obtain. In fact in some cases the chassis will be shared with a domestic model.

But some companies that are very big in surveillance are not known in the consumer electronics field. You would have to approach them directly to become a service agent. With the current rapid expansion in the surveillance industry however, manufacturers are looking for competent service agents.

Acknowledgements

My thanks to Jim Medley of the Mitsubishi Security Equipment Group and Martin Hanson of Panasonic Service UK for their valued help in providing background information for use in this article. ■

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STK 4141/V = 750
STK 4162/2 = 515
STK 4211/V = 1200
STK 4362 = 450
STK 4773 = 820
STR 4853 = 699
STK 5322H = 450
STK 5331 = 300
STK 5337 = 485
STK 5467 = 650
STK 5490 = 450
STK 7348 = 400
STK 8050 = 750
STK 736051 = 300
STR 441 = 1899
STR 451 = 2999
STR 454 = 1499
STR 5412 = 400
STR 50092 = 550
STR 50103A = 385
STR 54041 = 350
STR 58041 = 300
STRD 1816 = 399
STRD 6008 = 680
TA 8210 = 300
TA 8205 = 300
'TA 8200 = 350
TA 8207 = 165
TA 8216 = 390
TA 8644 = 499
TAA 550 = 030
TBA 1205 = 030
TBA 120T = 030
TBA 1013A = 299
TDA 1022 = 530
TDA 1060 = 325
TDA 11705 = 135
TDA 1520B = 330
TDA 1540 = 420
TDA 1600 = 360
TDA 2009 = 250
TDA 2170 = 1999
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TEA 1039 = 175
TEA 2018A = 150
TEA 2164 = 325
TEA 6300 = 685
UC 3842 = 150
UC 3844 = 150
UPC 1168 = 360
UPC 1216V2 = 110
UPC 4558C = 050
2SA 839 = 140
2SA 1232 = 250
2SA 1302 = 300
2SB 618 = 305
2SB 1292 = 150
2SC 901A = 350
2SC 1577 = 600
2SC 2200 = 250
2SC 3427 = 340
2SD 1391 = 300
2SD 1577 = 480
2SD 1887 = 435
2SD 2125 = 415
B4 500 = 265
B4 508A-PHIL = 80
B4 508AF-PHIL = 125
B4 5080D-PHIL = 110
B4 2508AF = 250
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Long-distance Television

DX conditions and reception. Satellite sightings and news. Roger Bunney reports. Also start of a basic guide to Sat-zapping

After an active and exciting May, Sporadic E conditions became rather quiet during June. Signal reception was mundane and repetitive, with none of the gloss of the previous month. The following SpE log sums things up:

4/6/96 RAI (Italy) ch. IA, B; Video (Italy) ch. E2; TVE (Spain) E2.
6/6/96 NRK (Norway) E2, 3.
7/6/96 TVE E3, 4; C+ (France) L2; RAI IA, B; Video E2; +PTT (Switzerland) E2, 3; RTS (Serbia) E3; NRK E3;STV (Slovakia) R2; YT (Ukraine) R1.
10/6/96 C+ L2.
12/6/96 RAI IA
13/6/96 RAI IA.
14/6/96 RAI IA, B; Video E2; TVE E2-4; RTP (Portugal) E2, 3.
15/6/96 RTP E3; TVE E3, 4.
16/6/96 RTS E3; TVE E2-4.
17/6/96 RTS E3.
23/6/96 RAI IA, B; Video E2; TVE E2, 3; C+ (Corsica) L4.
25/6/96 TVE E3.
28/6/96 NRK E2, 3.
30/6/96 TVE E2-4; RAI IA; Video E2; RTS E3.

We'll keep our fingers crossed for July! My thanks to Cyril Willis (King's Lynn), Peter Schubert (Rainham) and Garry Smith (Derby) for supplementing my own meagre log.

In a letter dated 19/6/96 Ryn Muntjewerff (Holland) comments that during an SpE opening the previous week he received JTV (Jordan) ch. E3, Iran ch. E2, Syria ch. E2, RTSH (Albania) ch. IC and an unidentified ch. E3 cartoon dubbed into Arabic with an octagon-shaped logo containing a palm tree in the top, left corner. Has anyone any ideas about this? Garry Smith mentions that YT-2, the Ukrainian second network, uses a white "YT-2" identification at the top left – also that Nova TV is the replacement for the former CST-1 network in the Czech Republic.

A colourful identification received from YLE (Finland) via Eutelsat II F4 at 7°E. Photo courtesy John Locker.

Satellite Sightings

June was a busy month in the Clarke belt, with numerous Euro '96 feeds and coverage of the G7 Summit talks in Lyon. Interesting sightings included signals from the Israeli AMOS-1 satellite and a mystery Russian satellite identified as Gorizont 15.

Our congratulations to Roy Carman (Sandown, IW) on the first UK sighting from AMOS-1 at 4°W. During the afternoon of July 1st he received, at 11·301GHz (H), weak signals using a 90cm dish and threshold extension. I checked at 1800 on July 2nd and found a sparkly though acceptable signal, using my 1·5m dish and an Echosphere LT730 receiver with the threshold set for 12MHz bandwidth. A PM5544 test pattern was being transmitted, with "Amos-1" in the top panel and numbers in the lower panel. There was no audio carrier on either the 1st or 2nd. I assume that this was the East European beam. Another report the previous weekend suggested that the Israeli spot beam had been received in the eastern Mediterranean.

The normally quiet Intelsat 515 at 18°W has been active in recent weeks with several European feeds from Moscow. NBC and CNN were both seen running NTSC news reports following the Russian elections. Further NTSC news packages were seen via 515 later in the month, at 11·582GHz (H). An unusual sighting was the Spanish "ARGANDA RETEVISION" test pattern, far from its usual Hispasat source at 30°W. Previous information indicated that the 702 satellite was to move from 1°W to 18°W, but another report suggests that 702 is to be slotted in elsewhere. The strong signal levels tend to confirm that 702 has indeed arrived at 18°W. Stay tuned!

The BBC units UKI-118 (Southampton) and UKI-231 (Plymouth) have been busy along the south/south west coasts, the former usually linking live into the Spotlight magazine programme. A recent UKI-118 transmission seen via Orion came from Barnstaple. UKI-118 was at Modbury, South Devon on the 2nd, and on June 18th it was transmitting with SIS

(sound-in-syncs) from the BMA conference at Brighton via the French Telecom 2C. Ulster TV's UKI-120 is another Telecom 2C customer: on the 25th it was covering the Prince Charles' banquet aboard the Royal Yacht Brittania in Belfast harbour.

The Italian horse and trap racing that was frequently received via Eutelsat II F3 (16°E) last winter and then disappeared (we assumed that it had gone digital) has reappeared via F2 (10°E) – check at around 11·163GHz (H). The same satellite has been carrying the former Yugoslav war crimes trials in The Hague – Roy Carmen advises checking at 11·073GHz (H) for daytime coverage.

Roy Carman also received an unlisted Russian satellite of the Gorizont type at 34°E, with "Mockba 6" and "TC1 THROUGH T GORIZONT 34E" captions, on several June mornings. The frequency was the usual Gorizont Ku band 11·525GHz. Ken Suddes (Welwyn) has also reported reception from this satellite, with an obviously inclined orbit.

Subsequently John Locker checked the Norsat Internet website where Roy reported reception of Gorizont 15 at 33°E with a 5·6° inclination – it's best seen in the UK at 0800, 2000 etc. hours. Another new sighting reported by John is a GALS Russian DBS craft at 36°E. A weak (East spot?) downlink was visible in the Wirral at 12·16GHz with RHC polarisation.

Ken Suddes surfs the text pages for satellite news. He suggests trying NBC page 171, EBN 645-8 and UK Gold 333. Can anyone suggest additions to this list?

During a typical week there are many corporate and instructional transmissions via Orion (37·5°W), many still in the clear. On most mornings Orion airs its own promotional offering – an interesting video that's well worth viewing.

The Middle East

Ruud Brand of the BDXC has been on holiday recently in Israel. He reports that PBC (the Palestine Broadcasting Corporation) is in operation in the Gaza strip, using ch. E25. The PM5544 test pattern and colour bars with logo are used. Programmes have a logo at the top right corner. There was no sign of the ch. E4 transmitter listed in the *World Radio and Television Handbook*.

The Syrian HOMS transmitter uses ch. E2, with separate services before and after 1600 GMT. Early programmes carry the top left corner logo "SYRIA": after 1600 this changes to "SYR". There is no text or VITS in the field blanking interval.

Jordanian programmes start at 0430 GMT, preceded by the PM5544/5534 pattern. There is much information in the field blanking period with JTV-1. JTV-2 opens at 1300 GMT.

There are two Israeli networks, IBA-1 and IBA-2. The top left logo for IBA-1 is either three overlapping circles or a candlestick. IBA-2 uses a large "2".

DAB

With the growth of digital audio broadcasting in Band III, though still experimental, more TV transmissions are being transferred to UHF. The Norwegian TV2 transmitters at Bergen and Oslo are to move to chs. E45 and E30 respectively. In Germany, the MDR-1 Dequede and Sonneberg transmitters are moving from ch. E12 to chs. E24 and E44. These transmitters used to give excellent Band III signals when tropospheric conditions were right, and will be missed. No definite time scale has been announced, but the changes are likely to take place during the next twelve months.

Satellite News

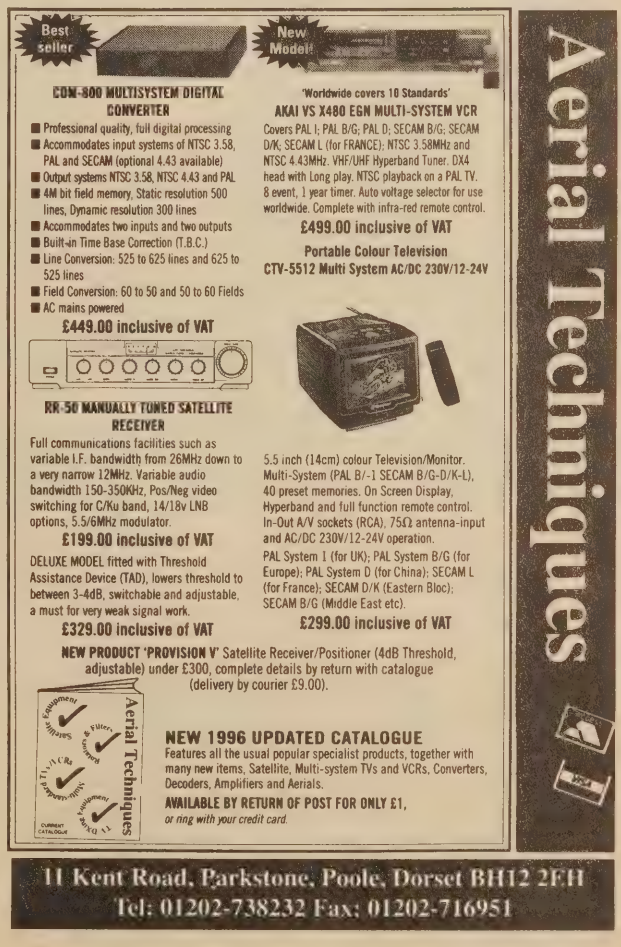
As mentioned in Teletopics last month, the new Astra slot for SES's series 2 digital satellites will be at 28·2°E. Orders for the 2A and 2B satellites have already been placed: 2A is expected to be launched in August 1997.

Sony has shipped quantities of set-top decoder boxes from its Welsh plant at Pencoed to France for the start of the Canal Plus satellite digital TV service, the first in Europe. Kirch's seventeen-channel German digital TV service DF1 was due to start on July 28th. Further expansion to fifty channels is planned for late October, via Astra 1F. BSkyB has agreed to take a stake of up to 49 per cent in DF1 and will share the cost of developing the venture. The combined group envisages a 200-channel service. BSkyB is continuing with plans for a 200-channel UK service to start late next year. It has sent a technical specification to set-top decoder manufacturers and has told them that it would like to see a million units available in shops by September 1997.

This Asiavision feed from Malaysia is another offering from 7°E. The feed to Europe is in C band, with European distribution in Ku band. Photo from John Locker. Note that the signal in this and the previous photo was SIS stabilised using an EBU decoder which includes audio recovery.

Basic Guide to Sat-zapping

Searching the Clarke belt for exotic signals is an easier hobby than traditional DX-TV, though perhaps a bit more expensive. Anyone interested in getting started would be well advised to buy a copy of the latest (5th) edition of John Breeds' *Satellite Television Installation Guide*, which is available from Swift Television Publications, 17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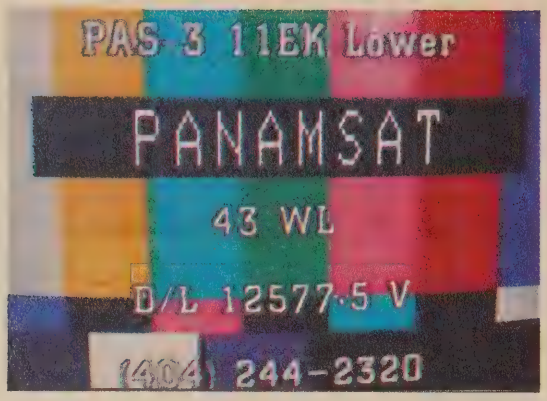

Just to prove that PAS-3 (PanAmSat) does sometimes come to life with Ku band transmissions, though they are rare.

Pittsfield, Cricklade, Wilts SN6 6AN (phone 01793 750 620) at £15 plus £2 postage (UK). It's a truly practical guide that will answer 99 per cent of your questions.

Our view of the Clarke belt in the UK runs from the horizon in the south east upwards to about 25-33° elevation (depending on your location) when looking due south then back to the horizon in the south west. Thus for reception from as many satellites as possible we need to be able to track this section of the belt accurately. Tracking dishes are driven by either an H-H (horizon-to-horizon) or a polar mount. The former is compact, neat and generally quiet in operation, but is more expensive than a polar mount.

The motor drive for the dish is remotely controlled by either the satellite receiver itself or a stand-apart controller. A multiway cable links the indoor unit to the motor, sending power and receiving back direction sensing pulses.

There are two main types of dish, offset and prime-focus. The former is the type used for about 99 per cent of Sky systems, with an LNB support arm that extends from beneath the dish. The prime-focus type is a circular dish with the LNB mounted centrally. For sat-zapping you should buy the largest dish you can afford, 90cm being the minimum. The larger the dish the higher its gain and the sharper its beam width. Lenson Heath produce well-made, cost-effective systems. This company's one-metre offset dish is a good compromise solution. Remember that planning regulations allow a dish of up to 90cm to be erected without permission in most areas.

Ideally you should be able to track from say 70°E to 70°W. Select a position that gives maximum coverage. My present location offers from 24°E to 40°W in winter. In summer the coverage to the east falls to 13° because of trees – your dish must see a clear sky.

Some dish motors are noisier than others. If you mount the dish on a wall, ensure that the motor is a low-noise type – otherwise neighbour problems will occur. Motor noise travels along a wall, which is bad news for sat-zapping late at night. Where possible it's best to use a garden stand for the dish. Always try to minimise the visual impact of the dish – avoid bright white when a laurel green version is available. It's a good idea to talk to your neighbours before you create your own Jodrell Bank!

I've had to deal with many domestic problems in the past relating to aerial masts, dishes etc. If you want advice on this and equipment sources I will try to help – include a stamped, addressed envelope please with any requests sent to me via the magazine's editorial office. ■

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An RGB-VGA Conversion

A way of using the Microvitec Series 7 monitor as a VGA driven unit. Ray Porter, M.Sc., C.Eng., MIEE describes the principles and practicalities

Many readily available surplus RGB monitors will, after relatively minor modification, operate with either older PCs that use TTL levels for their colour signal outputs (the CGA and EGA video standards) or the newer VGA analogue signal standard. The particular conversion described in this article was carried out to provide a colour display for a mono 486 lap-top computer, but it's also a way of providing a workshop test monitor for 8086, 286, 386 and 486 computer repairs. A Reuters CMV125MV monitor, which is a badged Microvitec 12L728NR3 (Series 7 chassis), was used as the patient. It was made in the late Eighties. The extra circuitry required can be laid out on a piece of stripboard, uses only a few standard components, and is powered by the monitor's 12V supply. There's room to mount the extra board behind the RGB connectors.

Standards

EGA and CGA sync and colour signals leave the PC via a 9-pin, D-type socket, entering the monitor via an identical connector. The first step is to test the monitor, using a suitable CGA/EGA PC if possible. You'll need a pin 1-to-1 etc. connected 9-pin, D-type cable for this test. VGA output from a PC is via a 15-way, high-density D-type socket (i.e. the shell size is that of a normal 9-way socket).

VGA computers have separate colour, colour return, sync and sync return pins, as shown in Fig. 1, but require a combined colour plus sync signal at each of the red (R), green (G) and blue (B) BNC input connectors. The Microvitec Series 7 chassis has a duplicate set of BNC sockets for connecting monitors in parallel. It takes its sync pulses from the G signal, but for the correct dynamic colour range the other two channels also require the voltage offset produced by the sync pulses. A test showed that 900mV of colour signal atop 300mV of negative-going sync produced full colour saturation.

Modification Details

Fig. 1 shows the circuitry. The line and field sync pulses are OR gated and added to the analogue colour signals as these are being fed to the monitor's RGB BNC input sockets. These inputs go to differential amplifiers: the positive input is to the centre pin, the BNC socket's outer being the negative input.

A rear panel switch enables either a 75Ω or a high-impedance differential input to be selected. A VGA monitor's normal input impedance is 75Ω, but set the switch to high Z. The reason for this is that a VGA monitor requires about 600mV for full colour saturation while these monitors require 900mV. A test on the computer signal levels at the end of two metres of 75Ω coaxial cable showed that for full colour saturation 1·7V was available through a 150Ω source impedance. When a modified (220Ω) cable termination was used, the required colour signal voltage was obtained without any mis-match problems being noticeable.

The sync signals in the VGA type 3 video standard (640 x 480 pixels) use negative logic, i.e. 0V = true, 5V = false. This means that they can be OR gated using a positive logic NAND gate (IC1a). The output from this is inverted (IC1b) and then used to drive transistor Tr1, which switches a 300mV source on and off at the negative amplifier inputs. Addition of the sync and colour signals is carried out by the differential amplifier action. Although I connected all three negative amplifier inputs together and drove them from the same 300mV source, no crosstalk or noise was apparent during my tests.

The layout of the modification circuit is not critical, but the input cables (each 2m of 75Ω coax) should be arranged so that the outers can be earthed closely together. Keep the output cables as short as possible. The 12V supply required can be found at pins 14 (+ve) and 7 (0V) of a 4047 DIP chip mounted on the RGB input PCB. The few mA consumed by the extra circuit is provided without any difficulty.

Notes on the 12L728NR3

(1) The model number is on a paper label which is stuck to the tube's bowl. The name Microvitec appears on only the tube base PCB.

(2) The power supply is based on a TDA4601 chopper control chip. A red LED on the power supply PCB

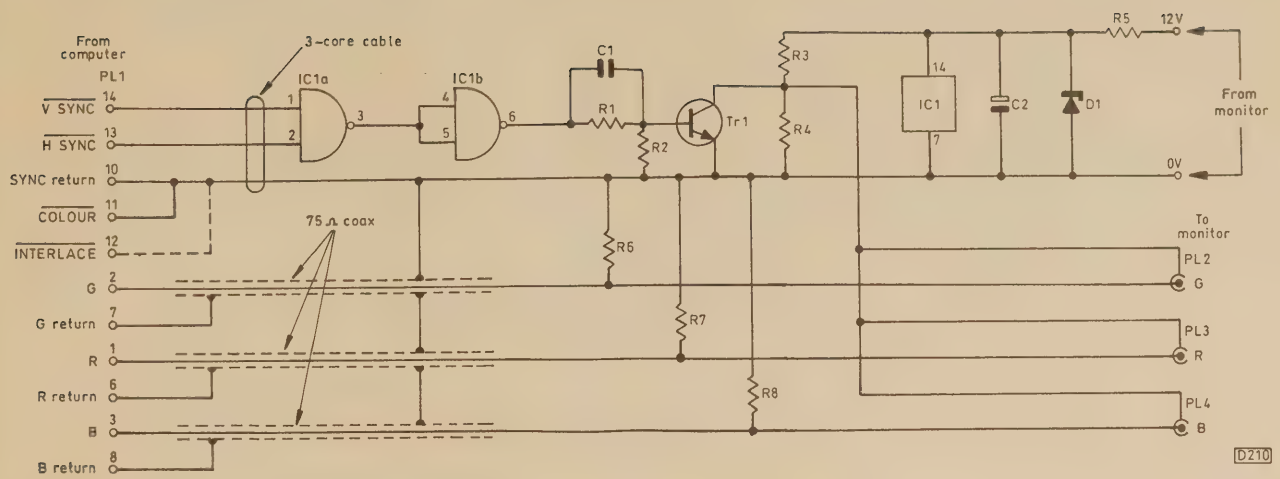

Fig. 1: Circuit diagram of the RGB-to-VGA converter. IC1's supply pins are 14 (5V) and 7 (chassis). Pin 12 of PL1 may need to be left unconnected as it is a computer input that reads the monitor's interlacing capability.

lights when the power supply is working. The chopper transistor is an SGSIF423. It will fail should C17 (1nF, 2kV) become dry-jointed. A BU508AF will work as a replacement.

(3) The HT for the line output stage is generated by a power switching monostable which operates with a 555 timer chip and is triggered by the line sync pulses. The monostable's output is smoothed by an *LC* filter to provide a supply whose voltage is proportional to the line scan frequency. This ensures that the line scanning rate is proportional to the line sync pulse frequency. A check on this voltage showed that it is 45V with CGA sync (15·625kHz) and 96V with VGA sync (31·25kHz).

When there are no sync pulses the line scanning stops but the field scanning continues: this is a 'green feature', to reduce power consumption.

The EHT voltage doesn't vary with the sync frequency. It depends on the rate-of-change of the flux in the line output transformer. This is fixed by the tuning of the windings, as with a conventional TV set.

(4) EW correction is based on a pulse-width modulated parabolic waveform that's derived from a TDA4950 chip. There is no need for a power transistor, as the power loss with this digital technique is low.

(5) The sync PCB has a red LED which comes on when sync pulses are being received.

(6) It's difficult to dismantle the monitor to gain access to the bottom PCB, on which the line output transformer is mounted.

Pull off the brightness and contrast control knobs and undo the potentiometer fixing nuts. Then undo the four CRT surround fixing screws, lift the CRT slightly and pull out the front PCB with the contrast and brightness potentiometers on it. After refixing the CRT surround you can slide out the bottom PCB, which will stand up or lie flat at the rear of the chassis, with all cables attached for servicing the module.

The side PCBs can be lifted and hooked in position to give better access generally. ■

Parts required

R1	10kΩ	R2	4·7kΩ
R3	2·2kΩ	R4	270Ω
R5	1kΩ	R6-8	220Ω

All 0·25W, 5%

C1	1nF, 50V ceramic
C2	20µF, 16V electrolytic
IC1	74HCT00 quad two-input NAND gate
Tr1	BC182
D1	BZY88C4V7
PL1	15W, high-density D-type connector (Maplin JW77J)
PL2-4	BNC cable plugs

Stripboard, wire, mounting pillars

Colour signal coaxial cable (PL1 to stripboard), three x 2m 75Ω min. lengths (Maplin XR88V)

Sync signal cable (PL1 to stripboard), 1 x 2m, 3- or 4-core, 0·2 unscreened

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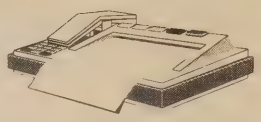

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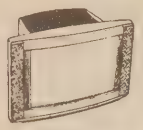

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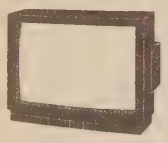

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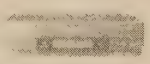

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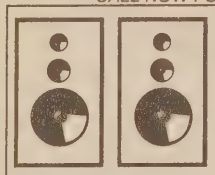

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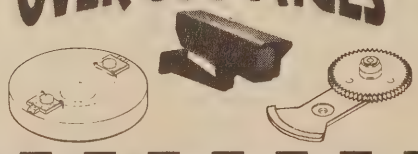

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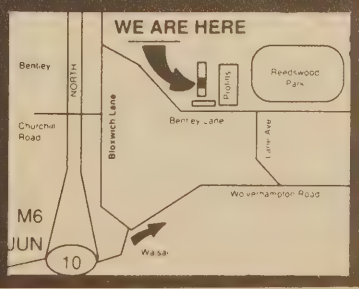

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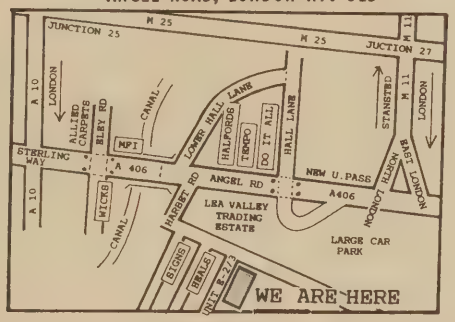

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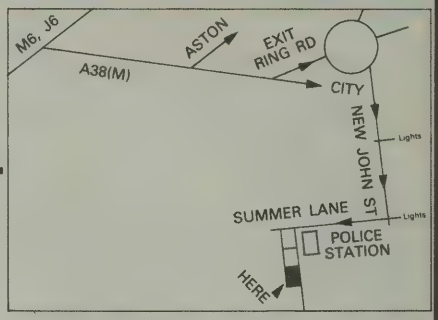

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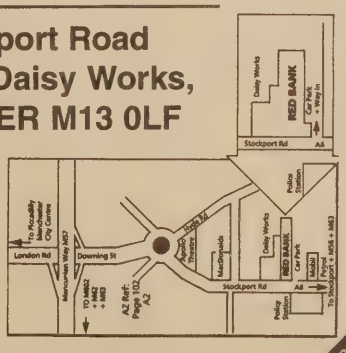

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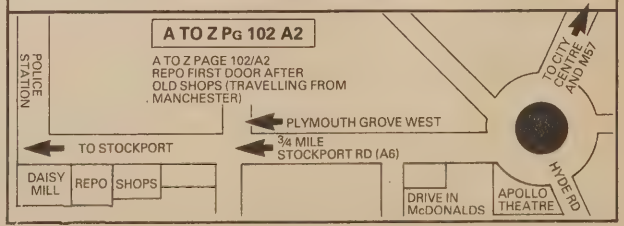

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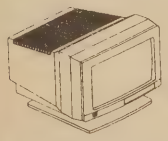

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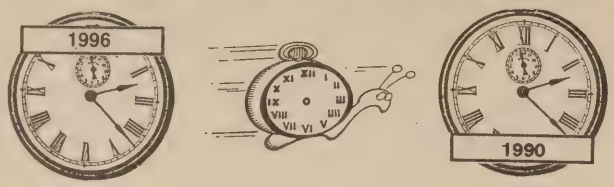

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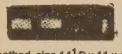

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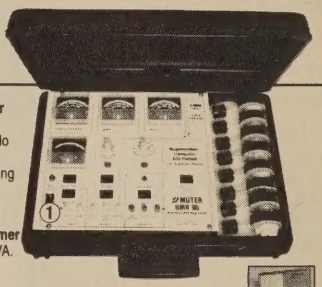

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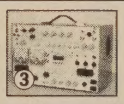

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Conversion Kit ITT Teletext	£8.00
Burglar Alarm Siren 12 Volt	50p
Good Lower Drum	£3.00
Tuners Nat. Pan. Small. UHF/VHF	£3.00
U321 – U341 – U342 – U343 – U344 – U944 Tuners	each £5.00
U743 – U744	£3.00
Tuner. IF TERC8-022A TBJZ4-00ZA Alps	£7.00
15 Mixed hand set LCD Video T/V	All new £20.00
Keyboard Mains Adaptor 12v/800m/a	£5.00
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Sound 5.5 MHz MPM 1000T	£1.00
Sound 6.0 MHz MPM 1040	£1.00
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TX100 Yellow Spot	£14.00
TX98 Chassis	£20
Ferguson FV31R Remote and Power Supply FV31R Display Panel	Post £2 £5.00
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U/V Tripler	£4.00
Grundig Tripler with Focus Pot	£7.00
Grundig Universal Tripler. Upright Printed Circuit type	£7.00
BG 2087-642-1005 Triplers	£7.00
BG 2032-642-3002	£7.00
PERDIO PV 1188 Handsets	£3.00
BU 208A, BU 508A, BU 508D, BU 508AF, BU 508DF	£1.00 each
BU 801	60p
2SD 1398	£1.00
BUT 11AF eqv	30p
Min Sat Receiver with IC M491 BBI, has tuner modulator etc	£5.00
FERGUSON Sat. Modulator SRD-3-4	£2.00
FERGUSON SRBI modulator	25p each
Regulated power supply, 500m/a 3-12v	£5.00
HITACHI 620E head and drum	£12.00
AMSTRAD Nicam head and drum	£12.00
AMSTRAD 6000 head and drum	£12.00
TATUNG universal tuner 205, or eqv with aerial socket	£8.00

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SAT - AUX

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THICK FILM
HITACHI HM9205A £4.00

PHILIPS NEW TYPE U/V HANDSET £10

06D4-025-001
Mains input choke for TX9 £4

TX100 REMOTE PANEL No. 56413IC M293B/ and SAA5012 £10 etc.

LEADER LMV-181A milli voltmeter (cost £255) 240v mains input Electronic voltmeter (1mv F.S.) 1mv-300v. **Calibrated £35**

R.S. SAFE BLOC
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Chassis Yellow Spot
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